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Southern Medical Association, Forty-Sixth Annual Meeting, Miami, Florida, November 10-13, 1952

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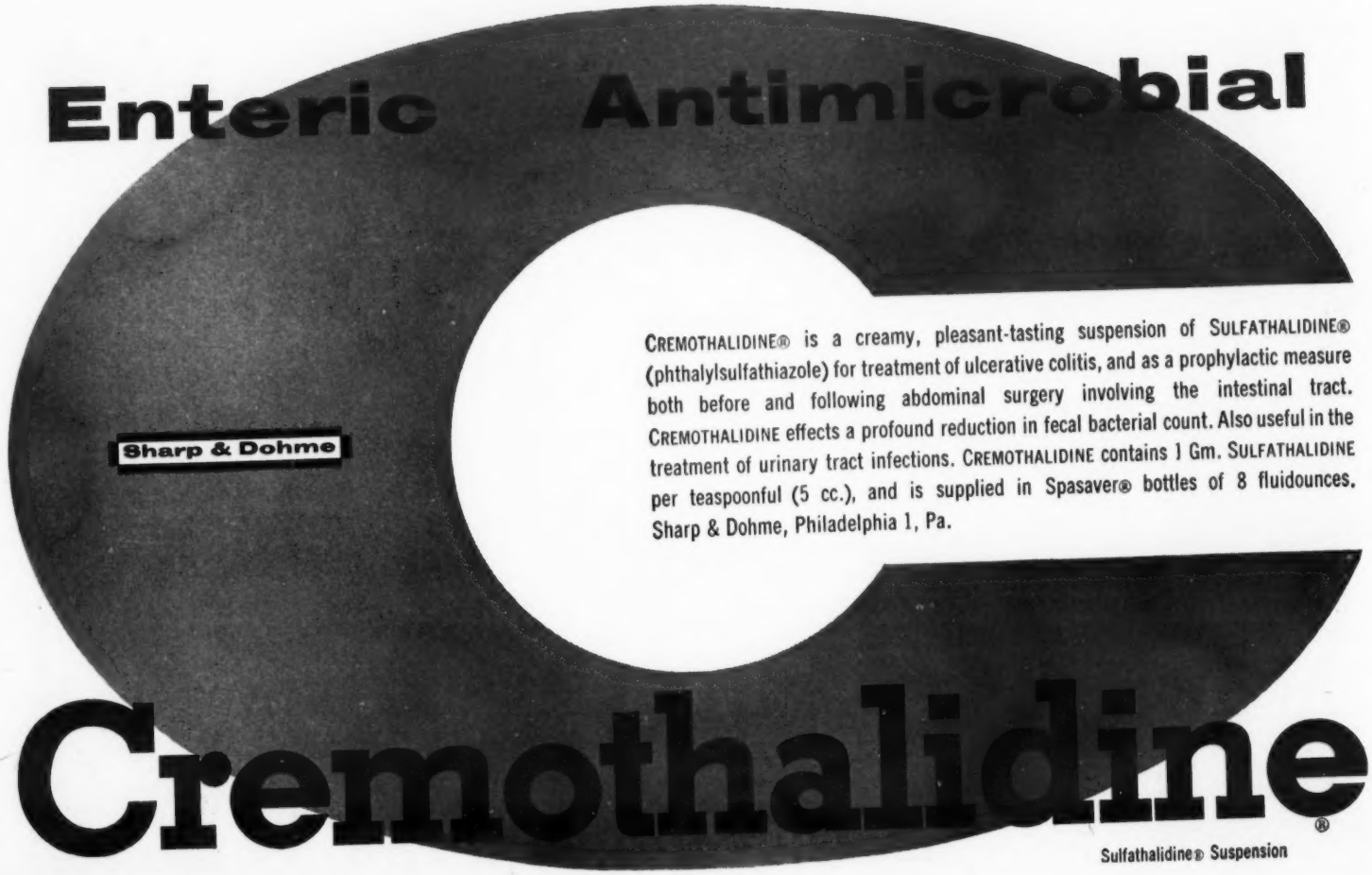
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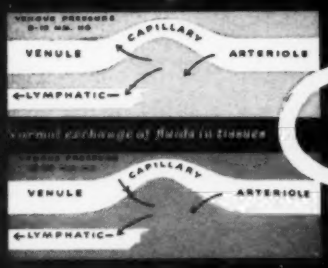

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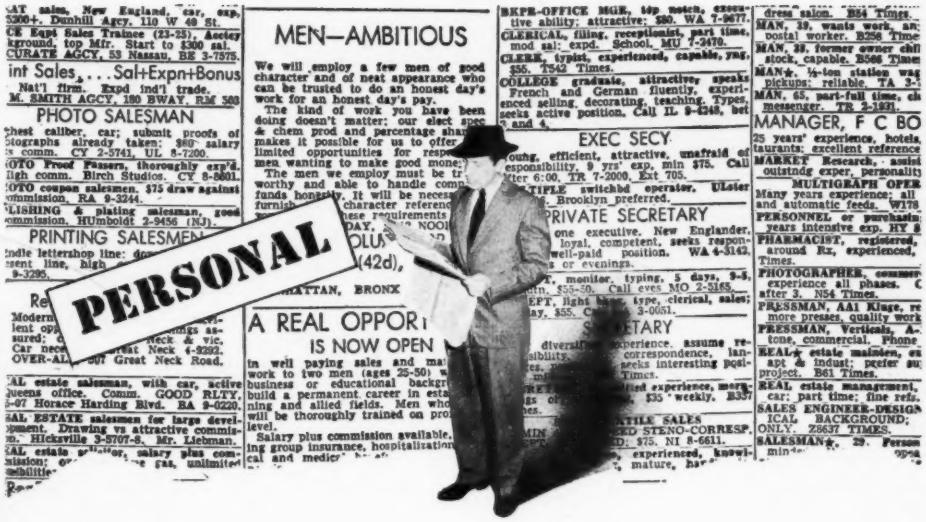

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1. Rossien, A. X. and Victor, A. M.: The Influence of An Antacid (nonreactive aluminum hydroxide gel) On Evacuation of the Bowels and the Fecal Column, *Am. J. Dig. Dis.*, *14*:226, 1947.

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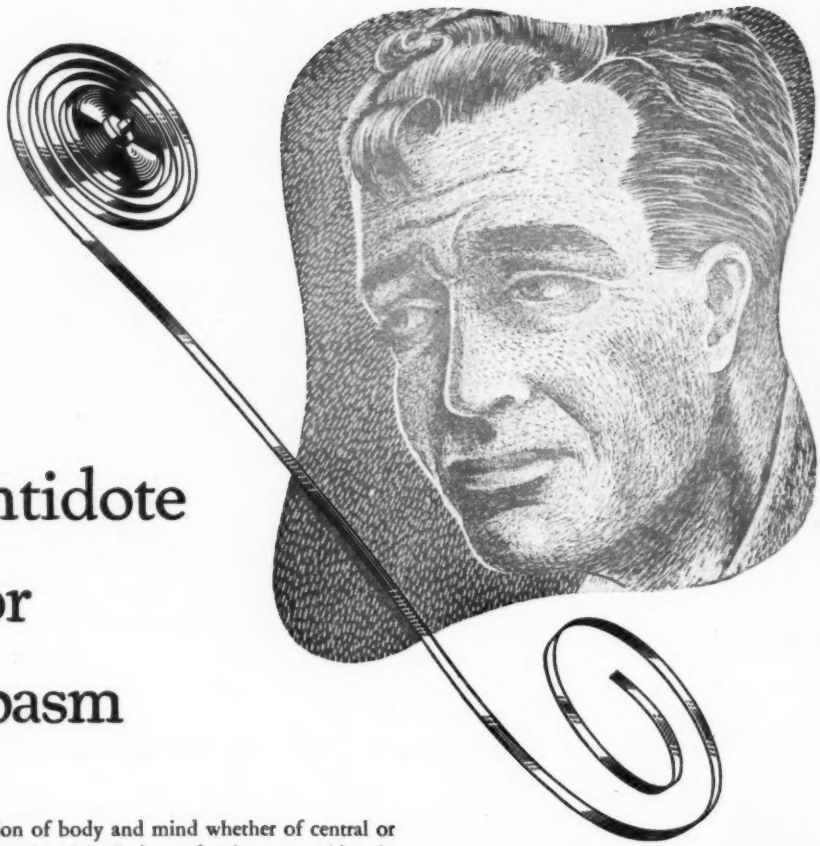

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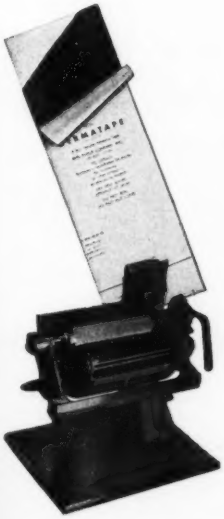

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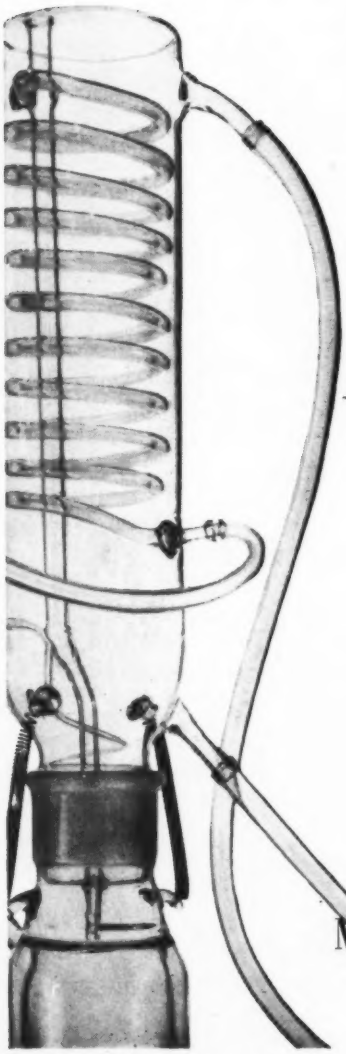

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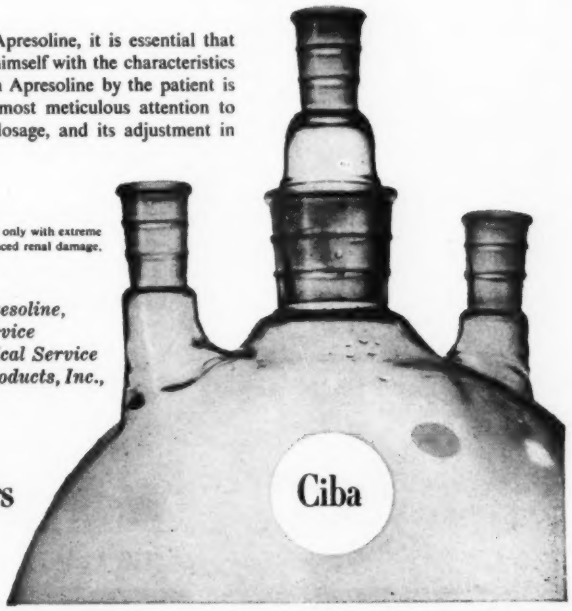

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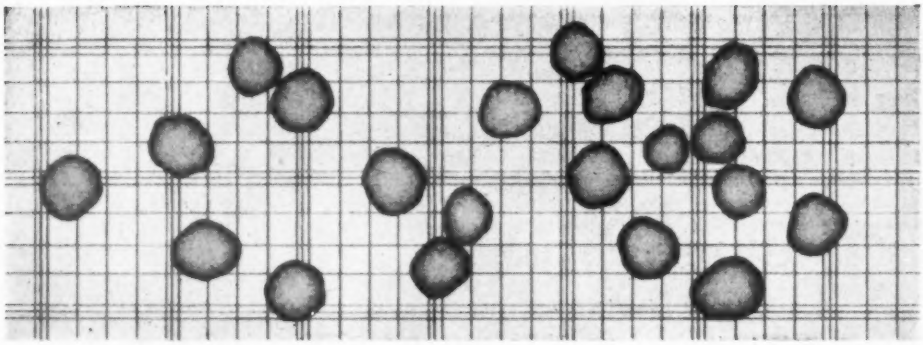

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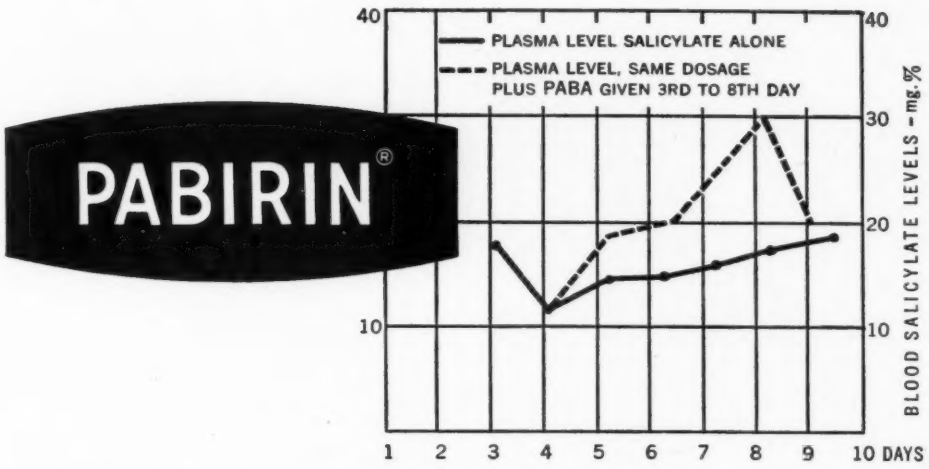

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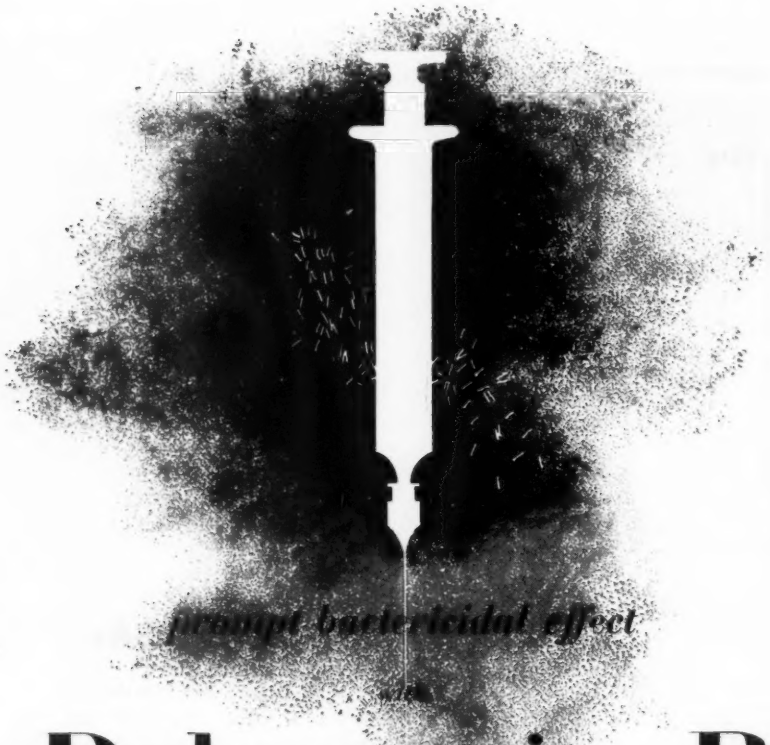

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on **small** *codeine dosage . . .*

When pain is too severe for relief by common analgesics, the use of Phenaphen with Codeine can often postpone or avoid resort to other narcotics. The additive influence of Phenaphen's ingredients—phenacetin, aspirin, phenobarbital and hyoscyamine sulfate—synergizes its codeine phosphate . . . permits its use in small dosage, free from its frequently adverse side-effects. Phenaphen with Codeine treats not only the pain, but "patients in pain" . . . easing the entire pain reaction pattern.

available as:

PHENAPHEN
(The original non-narcotic formula)

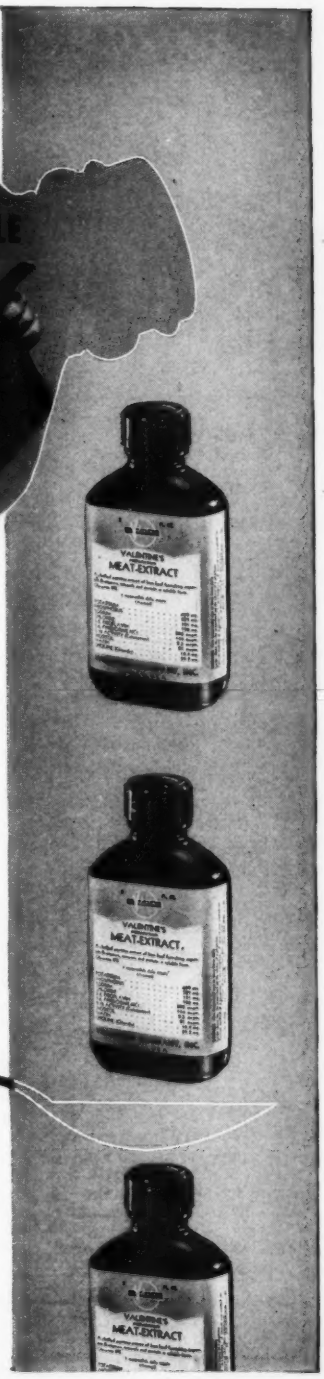
PHENAPHEN WITH CODEINE PHOSPHATE ¼ GR.
(Phenaphen No. 2)

PHENAPHEN WITH CODEINE PHOSPHATE ½ GR.
(Phenaphen No. 3)

A. H. ROBINS CO., INC. RICHMOND 20, VA.
Ethical Pharmaceuticals of Merit since 1878

Phenaphen® with Codeine

OLD AGE BENEFITS



VALENTINE'S MEAT EXTRACT

HAS SPECIAL VALUE FOR THE AGED AND AGING, PROVIDING:

the psychologic benefits of a "tonic", plus
the physiologic benefits derived from

- stimulation of failing appetites
- increased flow of digestive fluids
- supplementary amounts of vitamins, minerals and soluble proteins
- extra-dietary vitamin B_{12}
- protective quantities of potassium in a palatable and readily assimilated form

Supplied in bottles of 2 fluidounces.

DOSAGE: One teaspoonful two or three times daily. Two or three times this amount may be prescribed for potassium therapy.

VALENTINE COMPANY, INC.

RICHMOND 9, VIRGINIA

for Dramatic Response...

in HYPERTENSIVE CRISES

solution

INTRAVENOUS

VERILOID®

A powerful hypotensive agent, Solution Intravenous Veriloid, on slow infusion by vein, is capable of dropping the blood pressure in a matter of minutes in the majority of patients.

Thus it presents a lifesaving emergency measure in the conditions in which a continuing state of extreme hypertension might lead to serious complications. Hence it has rightly been termed "A Must in Every Emergency Bag."

In hypertensive states accompanying cerebral vascular disease, in malignant hypertension, and in hypertensive crisis (encephalopathy) arterial tension can be reduced—under full control of the physician—to a point compatible with the patient's condition. The only contraindications are pheochromocytoma and coarctation of the aorta; in patients receiving quinidine therapy the drug should be given with caution.

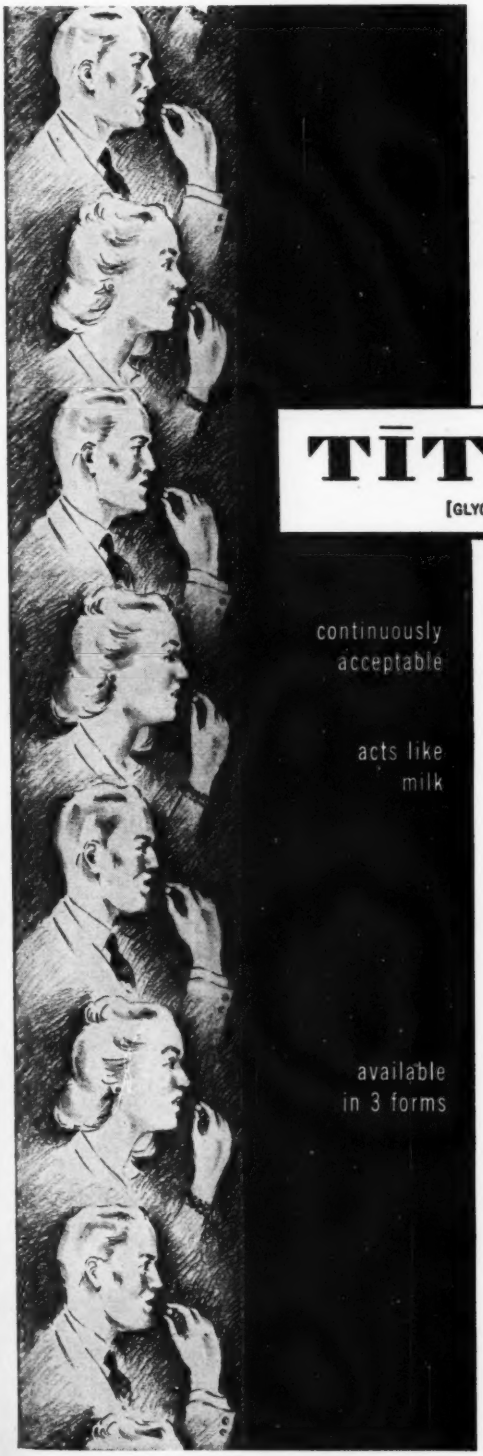
Solution Intravenous Veriloid makes available for the first time a purified fraction of Veratrum viride, a product of Riker Laboratories research, generically designated alkavervir, which can be administered by vein. Complete instructions for its use accompany each ampule. Physicians are invited to send for detailed literature.

Solution Intravenous Veriloid, 0.4 mg. of Veriloid standard reference powder per cc., is supplied in 5 cc. ampules.

ACCEPTED COUNCIL ON PHARMACY AND CHEMISTRY AMERICAN MEDICAL ASSOCIATION

RIKER LABORATORIES, INC.

8480 Beverly Boulevard Los Angeles 48, California



your patient
will not tire
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TĪTRALAC
TRADEMARK
[GLYCINE AND CALCIUM CARBONATE]

an effective antacid

continuously acceptable

TĪTRALAC's "just right" mint flavor and smooth texture ensure continuous acceptance.

acts like milk

TĪTRALAC's precise proportions of glycine and calcium carbonate provide a buffering action singularly like that of whole milk.

No systemic alkalosis or acid rebound... free from acid-generating sugars. Especially useful in milk-sensitive patients or where weight gain is undesirable.

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TĪTRALAC* Tablets..... Boxes of 40, bottles of 100 and 1000
TĪTRALAC Powder..... Jars of 4 oz.
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LAWRENCEBURG, INDIANA

new pediatric studies[1] prove

DESITIN®
OINTMENT
the pioneer external cod liver oil therapy

"soothing, drying and healing"[1,2] *in*
infant dermatoses

protective — Desitin Ointment "showed definite prophylactic properties" with the incidence of nonsuppurative dermatoses about one-third that of control group.

therapeutic — Desitin Ointment "was used successfully" in the treatment of both non-infectious dermatoses and various infections of the skin in the newborn infant.

in **diaper rash**
• **exanthema**
• **non-specific dermatoses**
• **intertrigo** • **chafing**
• **irritation**
(due to urine, excrement, chemicals or friction)

Desitin Ointment is a non-irritant blend of high grade, crude Norwegian cod liver oil (with its unsaturated fatty acids and high potency vitamins A and D in proper ratio for maximum efficacy), zinc oxide, talcum, petrolatum, and lanolin. Does not liquefy at body temperature and is not decomposed or washed away by secretions, exudate, urine or excrements. Dressings easily applied and painlessly removed.

Tubes of 1 oz., 2 oz., 4 oz., and 1 lb. jars.

write for **samples** and reprints

DESITIN CHEMICAL COMPANY •
70 Ship Street • Providence 2, R. I.

1. Heimer, C. B., Grayzel, H. G., and Kramer, B.: Archives of Pediat. 68:382, 1951.
2. Behrman, H. T., Combes, F. C., Bobroff, A. and Leviticus, R.: Ind. Med. & Surg. 18:512, 1949.

Gantrisin 'Roche'

antibacterial action plus...

greater solubility

Gantrisin is a sulfonamide so soluble that there is no danger of renal blocking and no need for alkalinization.

higher blood level

Gantrisin not only produces a higher blood level but also provides a wider antibacterial spectrum.

economy

Gantrisin is far more economical than antibiotics and triple sulfonamides.

less sensitization

Gantrisin is a single drug—not a mixture of several sulfonamides—so that there is less likelihood of sensitization.

GANTRISIN®—brand of sulfisoxazole
(3,4-dimethyl-5-sulfanilamido-isoxazole)

TABLETS • AMPULS • SYRUP

HOFFMANN-LA ROCHE INC.

Roche Park • Nutley 10 • New Jersey

You'd have to rope off half the street

. . . to accommodate all the patients who represent each of the many conditions for which short-acting NEMBUTAL *is effective*

HOW MANY of short-acting NEMBUTAL'S 44 uses have *you* tried?

To many a patient with insomnia, for example, a good night's sleep may depend on no more than one 50-mg. (¾-gr.) capsule of NEMBUTAL Sodium. *Note the dosage:* only about *half* that required by many other barbiturates. It's enough to erase anxiety and ease the patient into refreshing sleep—yet so small there's rarely cumulative effect or barbiturate hangover.

If you'd like details on how adjusted doses of short-acting NEMBUTAL can achieve any desired degree of cerebral depression—from mild sedation to deep hypnosis—write for your copy of "*44 Clinical Uses for* NEMBUTAL." Just address a card to Abbott Laboratories, North Chicago, Illinois. Abbott

In equal oral doses, no other barbiturate combines QUICKER, BRIEFER, MORE PROFOUND EFFECT *than . . .*

Nembutal®

(PENTOBARBITAL, ABBOTT)

44

OF NEMBUTAL'S CLINICAL USES

SEDATIVE Cardiovascular
Hypertension
Coronary disease
Angina
Decompensation
Peripheral vascular disease
Endocrine Disturbances
Hyperthyroidism
Menopause
Nausea and Vomiting
Functional or organic disease
acute gastrointestinal and emotional
X-ray sickness
Pregnancy
Motion sickness
Gastrointestinal Disorders
Cardiospasm
Pylorospasm
Spasm of biliary tract
Spasm of colon
Peptic ulcer
Colitis
Biliary dyskinesia
Allergic Disorders
Irritability
To combat stimulation of ephedrine alone, etc.
Irritability Associated With Infections
Restlessness and Irritability With Pain
Central Nervous System
Paralysis agitans
Chorea
Hysteria
Delirium tremens
Mania
Anticonvulsant
Traumatic
Tetanus
Strychnine
Eclampsia
Status epilepticus
Anesthesia
HYPNOTIC
Induction of Sleep
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PEDIATRIC Sedation for:
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Blood transfusions
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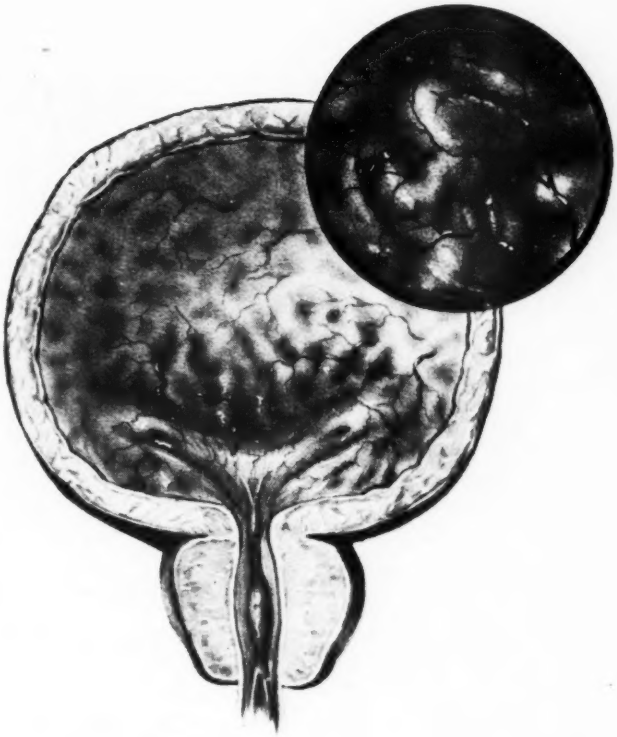
FOR INSOMNIA AND SIMPLE SEDATION
Try the 50 mg. (¾-gr.) NEMBUTAL Sodium Capsule



in urinary tract infections:

"Terramycin was selected [for 67 patients] in preference to other broad-spectrum antibiotics in view of high urinary excretion rate following small oral doses of the antibiotic." Post-operative pyuria was significantly reduced after 44 major gynecological operations, and various other genito-urinary complications responded equally well.

Blahey, P. R.: Canad. M.A.J. 66:151 (Feb.) 1952.

CRYSTALLINE TERRAMYCIN HYDROCHLORIDE

available | *Capsules, Elixir, Oral Drops, Intravenous, Ophthalmic Ointment, Ophthalmic Solution.*

ANTIBIOTIC DIVISION *Pfizer* CHAS. PFIZER & CO., INC., *Brooklyn 6, N. Y.*

NOW ELIMINATE VITAMIN LOSS

protect your small patients with protected vitamins

VI-MIX DROPS

(MULTIPLE VITAMIN DROPS, LILLY)

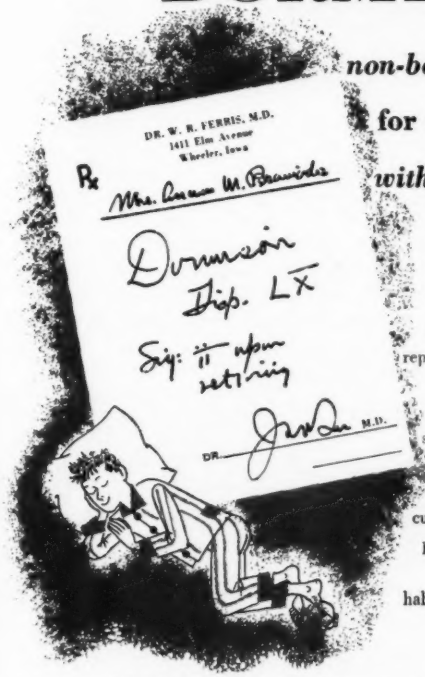
. . . a new type of pediatric preparation which stays fully potent *without refrigeration* from the date of manufacture until it is mixed just prior to use in the home.

All the essential vitamins which remain stable in solution are in one bottle. Another contains a powder consisting of those vitamins which best retain their stability when kept dry. Simply instruct that the liquid be added to the powder. Make sure. Put babies on 'Vi-Mix Drops.'

ELI LILLY AND COMPANY • INDIANAPOLIS 6, INDIANA, U. S. A.

For insomnia... *you can prescribe with safety*

DORMISON



***non-barbiturate* hypnotic**

for SAFE, SOUND SLEEP

without drug hangover

The extraordinarily wide margin of safety of DORMISON permits patients who awaken in the early morning and desire more sleep to repeat the dose. DORMISON is rapidly metabolized (one to two hours) so that there is no prolonged suppressive action. Patients awaken rested and refreshed as from normal slumber. DORMISON has no cumulative effect, no toxic effects on prolonged use. There is no evidence to date that DORMISON has habit-forming or addiction properties.

DOSAGE: Two 250 mg. capsules are recommended, although many patients respond to one.

DORMISON* (methylparafynol-Schering), capsules of 250 mg., bottles of 100.

*T.M.

Schering CORPORATION, BLOOMFIELD, N. J.

DORMISON

To combat intestinal and extra-intestinal amebiasis, found in every state of the Union:

MILIBIS,® because of relative insolubility, assures high concentration in the large intestine, very effective against subacute and chronic amebiasis. Average adult dose: 0.5 Gm. (1 tablet) three times daily for 7 to 10 days, repeated if necessary. Control acute dysentery first or concurrently with emetine.

Supplied in 0.5 Gm. tablets, bottles of 25.

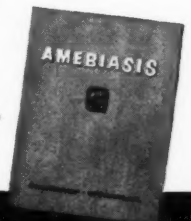
ARALEN® Diphosphate —the well known antimalarial—induces *complete clinical remission* in pleuropulmonary amebiasis[1] as well as hepatic and other forms of extra-intestinal amebiasis.[2,3] Average adult dose: 1 Gm. (4 tablets) daily for 2 days, then 0.5 Gm. daily for 2 to 3 weeks, which may be combined with or successive to Milibis therapy of intestinal amebiasis.

Supplied in 0.25 Gm. tablets, bottles of 100 and 1000.

Milibis and Aralen, trademarks reg. U. S. & Canada, brand of bismuth glycolylarsanilate and chloroquine, respectively.

1. Lindsay, A. E., Gossard, W. H., and Chapman, J. S.: *Dis. Chest*, 20:533, Nov., 1951.
2. Conan, N. J., Jr.: *Am. Jour. Med.*, 6:309, Mar., 1949.
3. Emmett, J.: *J.A.M.A.*, 141:22, Sept. 3, 1949.

Illustrated brochure on request.



WINTHROP-STEARNS INC.
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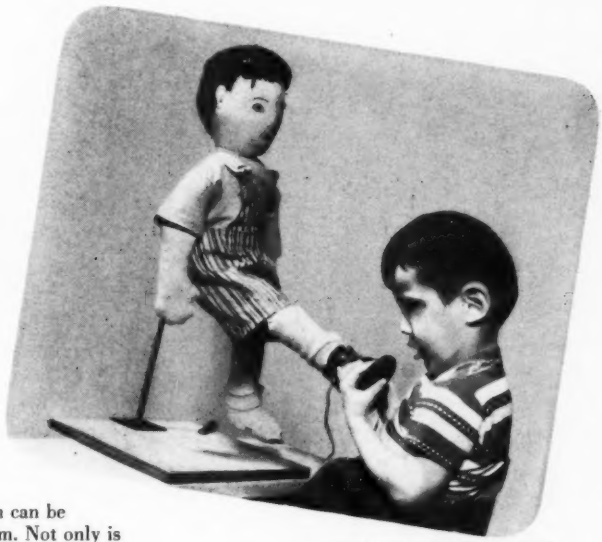

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with motion— and sound

Almost any teaching or training program can be improved by the use of 16mm. sound film. Not only is interest added but learning is more efficient with the audio-visual combination. Such films can go right to the point and, when desired, they can carry the information, findings, technics to many different audiences.

Therapy, cerebral palsy. Photograph, courtesy of The Edith Hartwell Clinic of the Strong Memorial Hospital, Le Roy, N. Y.

Complete line of Kodak Photographic Products for the Medical Profession includes: cameras and projectors—still- and motion-picture; film—full color and black-and-white (including infrared); papers; processing chemicals; microfilming equipment and microfilm.

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For further information see your photographic dealer or write for booklet F1-54.

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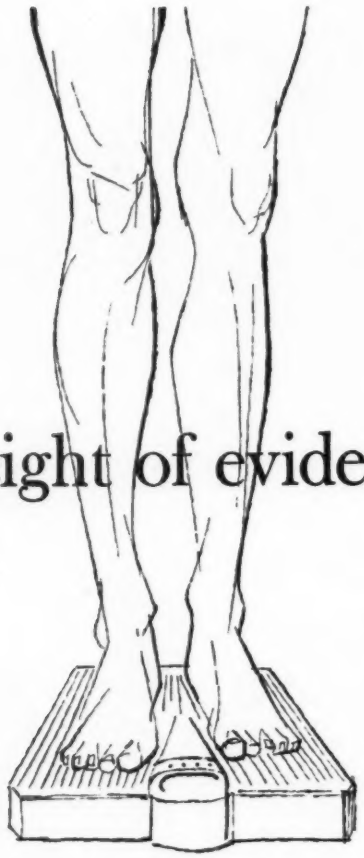

weight of evidence

Weight increases up to 6 lbs. a week, paralleled by increase in appetite, strength, well-being, are evidence of Lipomul's effectiveness as a caloric supplement. Lipomul provides fat that is calorie-rich, small in volume, and highly emulsified for palatability and ready assimilation.

℞ Lipomul*-Oral

Lipomul-Oral contains:

Vegetable Oil ..... 40% w/v
Dextrose, Anhydrous ..... 10% w/v
Preserved with Sodium Benzoate... 0.1%

May be given in milk (plain or flavored).
Lipomul-Oral is supplied in pint bottles.

*Trademark, Reg. U.S. Pat. Off.

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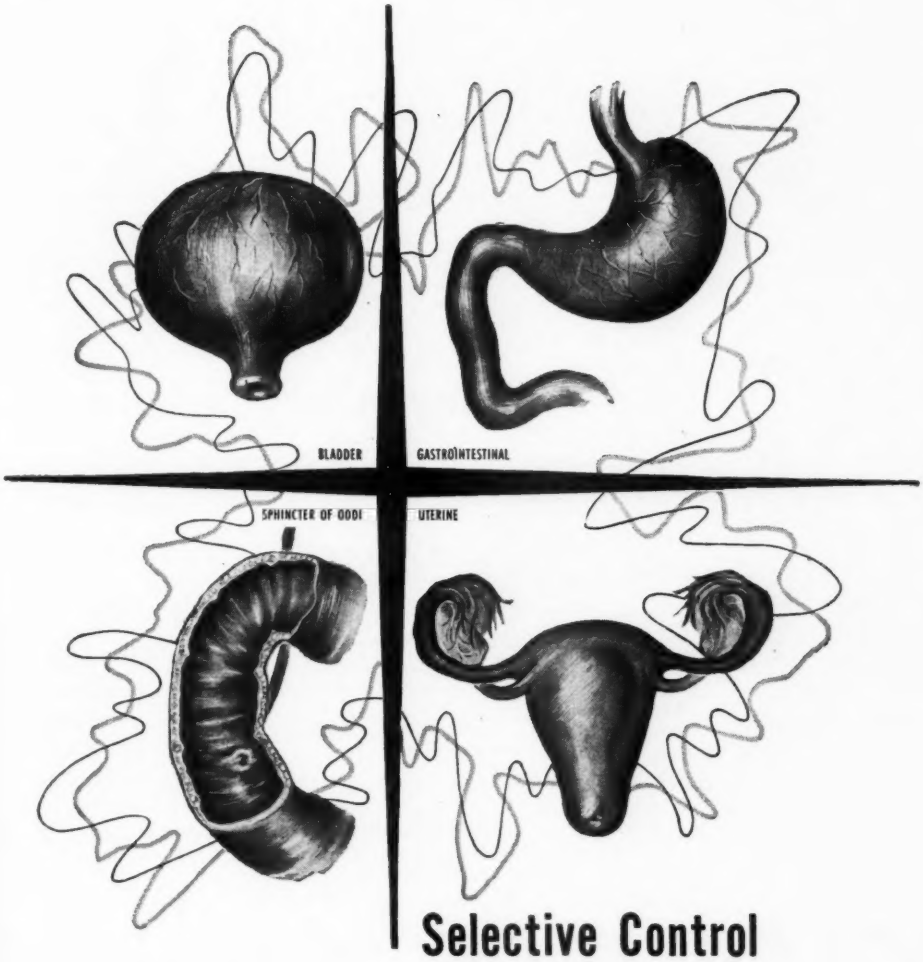
for medicine... produced with care... designed for health

THE UPJOHN COMPANY, KALAMAZOO, MICHIGAN



Selective Control

OF SMOOTH MUSCLE SPASM

Hypertonic states of the gastrointestinal, uterine or bladder musculature are thought to be the combined result of an autonomic imbalance and direct overstimulation of the smooth muscle cells.

Pavatrine® with Phenobarbital offers particular help to the tense, nervous patient who is suffering the distress of smooth muscle spasm. Pavatrine effects a combined neurotropic and musculotropic spasmolysis while the mild sedation of phenobarbital helps to control undue nervous excitability.

Each tablet contains 125 mg. (2 grains) of Pavatrine (β-diethylaminoethyl fluorene-9-carboxylate hydrochloride) and 15 mg. (¼ grain) of phenobarbital.

PAVATRINE® with PHENOBARBITAL

Searle *RESEARCH IN THE SERVICE OF MEDICINE*

control companion to ACTH and CORTISONE

"In clinical practice it is clearly wise to test the urine of both diabetic and non-diabetic patients for sugar at intervals during administration of cortisone or ACTH and to carry out appropriate investigations and treatment if glycosuria occurs. Particular caution is necessary for diabetic patients."
Sprague, R. G.: Cortisone and ACTH, Am. J. Med. *10*:567, 1951.

To avoid such clinical surprises and simplify clinical control, ACTH and cortisone therapy is profitably *preceded, accompanied* and *followed* by routine testing for urine-sugar. *Clinitest* Reagent Tablets provide a rapid, reliable and convenient method—easily used by both physician and patient.

CLINITEST *for detection of urine-sugar*

BRAND ◆ REG. U. S. PAT. OFF.

REAGENT TABLETS

You can assure regular, reliable urine-sugar analyses by prescribing the Universal Model Set (No. 2155). Available at all pharmacies at $1.50.

AMES COMPANY, INC.
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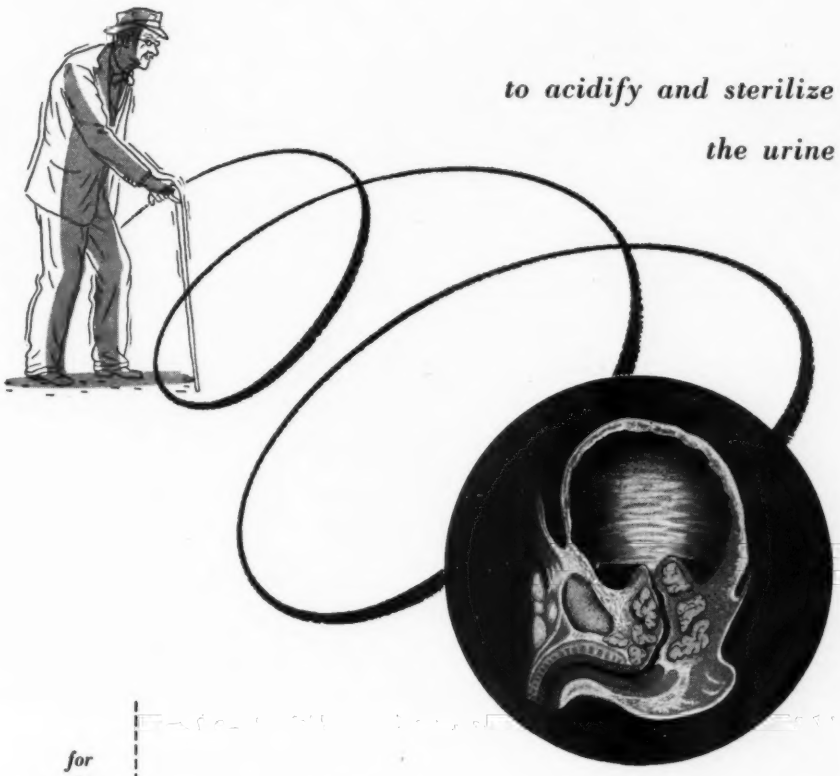

to acidify and sterilize the urine

for the prevention and treatment of urinary infections

Uro-Phosphate

METHENAMINE 7½ GR. WITH ACID SODIUM PHOSPHATE 10 GR.

SAFE: Uro-Phosphate is universally well tolerated . . . non-cumulative and non-toxic.

EFFICIENT: Each dose provides the *simultaneous* administration of methenamine and acid sodium phosphate, balanced for optimal liberation of formaldehyde.

ECONOMICAL: Whether your patient requires intensive therapy or smaller prophylactic doses, Uro-Phosphate provides effective medication at moderate cost. In active infections, the usual dose is 2 tablets dissolved in a glassful of water, three or four times daily.

Poythress

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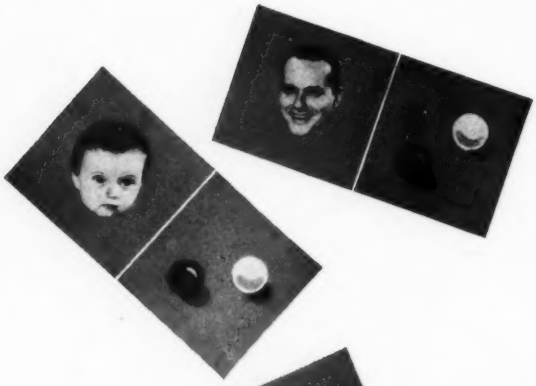

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ADULTS

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INFANTS & CHILDREN (UP TO 6)

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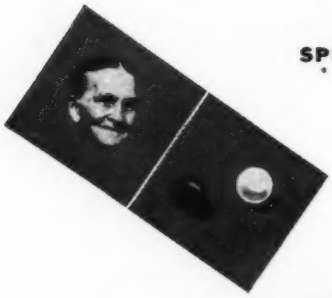

FIRST AND ORIGINAL MULTIPLE VITAMIN-MINERAL CAPSULES

Built on the original concepts of Dr. Casimir Funk . . . that vitamins and minerals are nutritionally interrelated . . . that deficiencies are multiple and occur simultaneously.

Only Vi-Syneral supplies 5 different potencies specially formulated for 5 different age groups.

Samples and Literature **U. S. VITAMIN CORPORATION**
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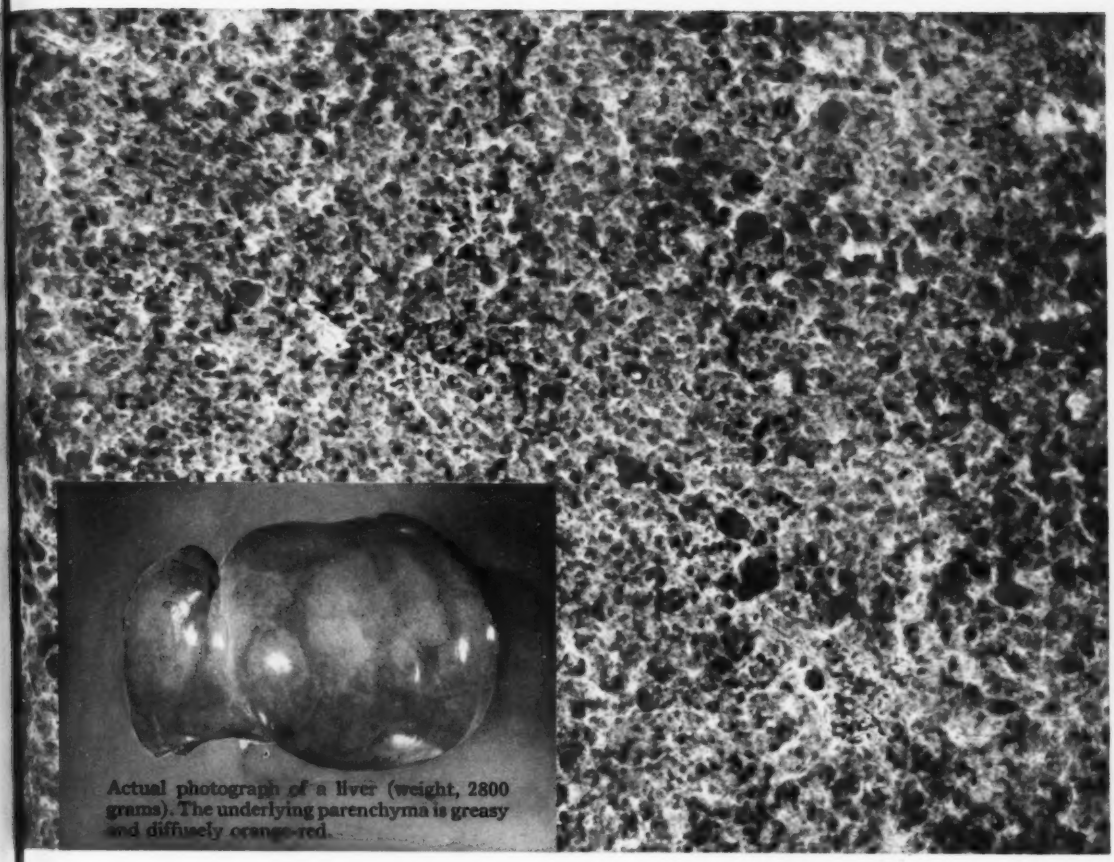

Actual photograph of a liver (weight, 2800 grams). The underlying parenchyma is greasy and diffusely orange-red.

Microscopic section of liver stained for fat with Sudan 4 and counterstained with hematoxylin. The numerous fat-laden liver cells show up orange-red in color. Magnification: X 60. Inset shows liver from which section was taken.

The liver of an overweight patient

Weight reduction—of even a few pounds—is often the surest means of lengthening life and diminishing future illnesses.

'Dexedrine' Sulfate curbs appetite, makes it easy for the patient to adhere to a low-calorie diet and thus to reduce weight safely—without the use (and risk) of such drugs as thyroid.

Smith, Kline & French Laboratories, Philadelphia

Dexedrine* tablets & elixir

the most effective preparation for control of appetite in weight reduction

*T.M. Reg. U.S. Pat. Off. for dextro-amphetamine sulfate, S.K.F.

The heavy veil of mental depression often falls upon modern man in his struggle against the growing complexities of these troubled times.

In such cases, you have need for—and will welcome—the unsurpassed antidepressant action of **'Dexedrine' Sulfate.** By restoring your patient's mental alertness and optimism, by inducing a feeling of energy and well-being, 'Dexedrine' lifts your patient out of the gloom of depression and helps make him emotionally fit to face the future.

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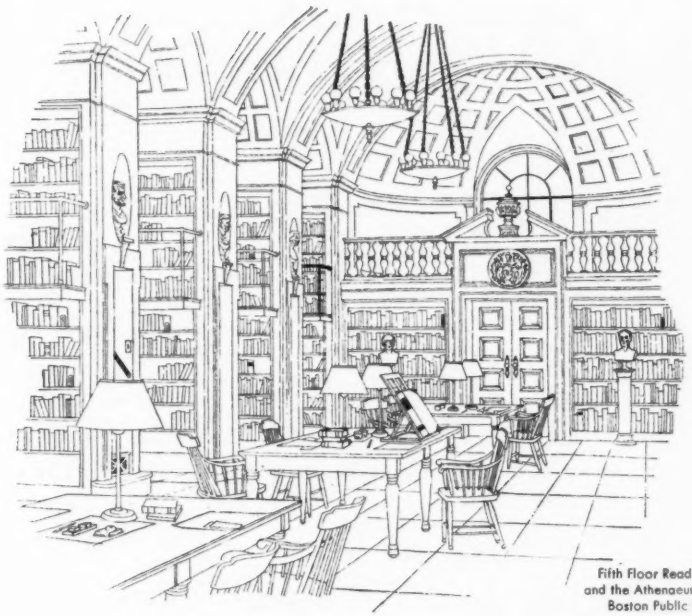
'Dexedrine' T.M. Reg. U.S. Pat. Off. for dextro-amphetamine sulfate, S.K.F.



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From among all antibiotics,
Obstetricians and Gynecologists often choose

AUREOMYCIN

Hydrochloride Crystalline

Because

Aureomycin diffuses so rapidly that it becomes available immediately to all the tissues in and about the pelvis.

Aureomycin readily passes into the blood stream, and through the placenta into the fetal circulation.

Aureomycin may be given by the oral, or in an emergency by the intravenous, route.

Aureomycin has been reported clinically effective when used systemically against susceptible organisms in many gynecologic and obstetrical infections, including:
Parenteral and Post-partum Infectious Complications • Mastitis • Thrombophlebitis • Pyelitis of Pregnancy • Staphylococcal Infection in the Newborn

Throughout the world, as in the United States, aureomycin is recognized as a broad-spectrum antibiotic of established effectiveness.

Capsules: 50 mg.—Bottles of 25 and 100; 250 mg.—Bottles of 16 and 100.
Ophthalmic: Vials of 25 mg. with dropper; solution prepared by adding 5 cc. of distilled water.

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DOSAGE: millionths of a gram

RESPONSE: millions of red blood cells

RUBRAMIN B12

Rubramin supplies vitamin B_{12}, the most potent anti-anemia substance known, in potencies to meet every need:

15 MICROGRAMS PER CC. ..... 1 cc. ampuls

30 MICROGRAMS PER CC. ..... 1 cc. ampuls
5 cc. vials
10 cc. vials

50 MICROGRAMS PER CC. ..... 10 cc. vials

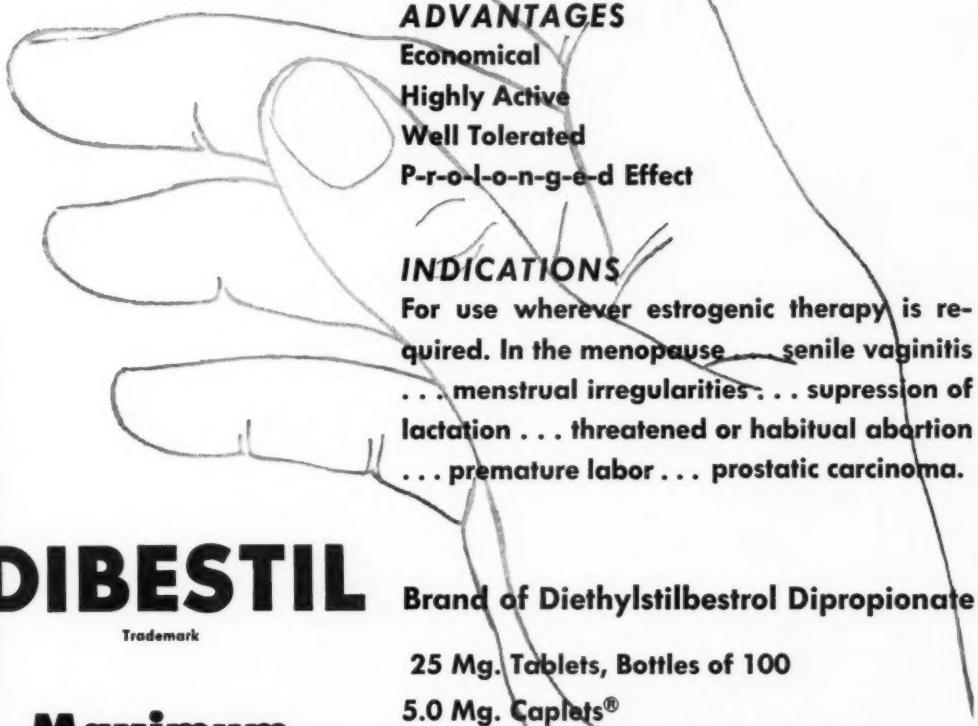
Rubramin is aqueous, protein and pyrogen free, practically painless on injection, safe even for patients allergic to parenteral liver, rigidly standardized in vitamin B_{12} activity.

Also available: Solution Rubramin Crystalline (Squibb Crystalline Vitamin B_{12} Solution) in 1 cc. ampuls, 15 micrograms of crystalline vitamin B_{12} per ampul, and 10 cc. vials, 30 micrograms of crystalline vitamin B_{12} per cc.

SQUIBB

"RUBRAMIN" (REG. U. S. PAT. OFF.) IS A TRADEMARK OF E. R. SQUIBB & SONS

Complete ORAL ESTROGENIC THERAPY AT YOUR FINGERTIPS



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Economical
Highly Active
Well Tolerated
P-r-o-l-o-n-g-e-d Effect

INDICATIONS

For use wherever estrogenic therapy is required. In the menopause . . . senile vaginitis . . . menstrual irregularities . . . supression of lactation . . . threatened or habitual abortion . . . premature labor . . . prostatic carcinoma.

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Brand of Diethylstilbestrol Dipropionate

25 Mg. Tablets, Bottles of 100

5.0 Mg. Caplets®
Bottles of 100, 250 and 1000

1.0 Mg. Caplets
Bottles of 100, 500 and 1000

0.5 Mg. Caplets
Bottles of 100, 500 and 1000

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Bottles of 100, 500 and 1000

Maximum Dosage Flexibility

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Aluminum PENICILLIN
Oral Tablets

Greater effectiveness by the ORAL ROUTE

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RENAL LITHIASIS: A NEW CONCEPT CONCERNING ETIOLOGY, PREVENTION AND TREATMENT*

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Concepts concerning the etiology of renal lithiasis and consequently its treatment, have changed considerably in recent years as the result of intensive laboratory and clinical investigation.[1-20] Most of this research has been directed toward the "crystalloidal" substances excreted in the urine. Attempts at diminishing the concentration of crystalloids in the urine or freeing crystalline material from a stone have not proven entirely successful, except when certain metabolic disorders have been corrected.

The terms crystalloid and colloid substances have been generally employed by the urologist to denote definite states of matter. Evidence from macroscopic, micro- and ultramicroscopic studies causes one to conclude that crystalline material may exist in a colloidal state and vice versa. The so-called colloidal, amorphous, and crystalloidal states are universal properties of matter. It thus follows that colloids and crystalloids are by no means two special entities, but there exists a close relationship between them. In recent years, the science of colloid chemistry has opened up an entirely new concept of the states of matter.

The observation of physico-chemical phenomena displayed by colloids is a relatively new and somewhat less familiar method of examining and interpreting the behavior of substance, especially in living organisms. Colloids or material in a colloidal state, are aggregate of molecules. They occupy a position between microscopic and molecular dimensions. Their sizes are considered to range from 0.001 mu to 1 mu (10^{-7} to 10^{-4} cm.). Because of the extreme minuteness of colloidal particles, forces come into play which are negligible in greater dimensions. These forces are dynamic, not static factors.

Our efforts have been focused upon the role of colloids in the etiology, treatment and prevention of calculous disease. Urine is a highly saturated solution of extremely complex composition. The unusual solubility of stone-forming salts depends upon the presence of certain colloids, which prevent precipitation of salts and other colloids. From what is known of the effects of colloids in increasing the solubility of stone-forming salts and preventing their precipitation, it is logical to assume that if this protective power is diminished or absent, urinary deposits will form much more readily. The protective action of urinary colloids is of major importance in preventing precipitation, agglomeration, and conglomeration of crystalloids. If the concentration of such protective colloids is insufficient, the crystal nuclei are "sensitized" and stone formation begins or is accelerated.

During the time one of the authors (A.J.B.) was stationed on various islands in the Pacific Ocean during World War II, there was excellent opportunity to observe the incidence of stone formation among persons of many ethnic groups, religion and nationalities. From these observations, it became evident that the only common factor which applied in the majority of cases was that of the presence or absence of

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protective urinary colloids in the various cases studied. The significance of urinary colloids in relationship to stone formation was further investigated in West Florida, which is a recognized area of high stone incidence.[21–25]

Six hundred and eighty patients were studied. Urine specimens were obtained aseptically from both male and female patients, and were subjected to ultramicroscopic examination, determination of electric charge carried by the colloidal particles, determination of the surface tension, and photo-ultramicrographic studies. These studies revealed that the degree of protective colloidal activity present in the urine was almost inversely proportional to the incidence of stones.

The concentration of ultramicroscopically visible colloidal particles in urine from Negroes greatly surpassed the concentration of such colloidal particles in white subjects. Some races are more prone to urinary lithiasis than others. The Negro is relatively immune. Vermooten[17] observed that the South African Negro rarely experiences formation of renal calculi. He found only one case of stones upon examination of the records of 1,090,000 Negroes admitted to the Johannesburg Hospital. At the same time, the white population of South Africa, according to the records of 126,000 patients admitted, had renal calculi in the ratio of 1 to 460 patients. Negroes in the United States are also less liable to stone formation than those of the white race.[26–29] An analysis of 250 cases of renal lithiasis observed by us during a three-year period, revealed only six Negro patients (2.4 per cent) with renal stone. Approximately ten per cent of patients seen by us are Negroes. Excretory radiographic studies are routinely made on all of our private and charity patients. Renal and ureteral stones are considered as one disease since ureteral calculi presumably all form in the kidney.

The urine of females generally showed a higher concentration of colloidal matter than that of males. In practically all statistical series, the incidence of stone is significantly higher in males than in females. In our series of 250 cases of renal lithiasis, there were 167 males and 83 females. Of significant interest was the fact that the amount of ultramicroscopically visible colloidal matter in urine from pregnant women far surpassed the concentration of such colloidal particles found in that of nonpregnant women. According to previous concepts, the parturient women, with dilatation and stasis of the urinary tract, often complicated by infection, should be very prone to develop renal calculi. This, however, is not true. Analysis of collected series of 49,000 obstetrical cases revealed only 15 or 0.03 per cent complicated by stone.[30–33] This would indicate that pregnancy does not predispose to calculous formation, but actually aids materially in preventing stone formation.

Surface tension determinations were made with the pendant drop method on urine of various patients after it had been subjected to ultracentrifuging, by which all matter visible in the ultramicroscope was removed. The results clearly demonstrated that urine of white females has a pronouncedly higher surface tension than that of Negro females; the former averaging 60 dynes per centimeter, the latter 52 to 55 dynes per cm. It could also be demonstrated that the surface tension of urine of both white and Negro females decreases during pregnancy. In addition, it was interesting to note that the amount of colloidal particles visible in the ultramicroscope greatly increases with the time the woman is pregnant. This would indicate that the concentration of the capillary-active substance, the composition of which is being further investigated, has passed the threshold of ultramicroscopically-sized stone formation.

Electrophoretic studies of the non-centrifuged urine samples, revealed that urine which gave a low surface tension had all been obtained from patients who are more or less immune to stone formation, as are Negroes. This seems to show quite clearly that it is the presence of capillary-active lyophilic colloids which is responsible for this favorable condition. The presence of these capillary-active agents is a predominant factor in preventing stone formation from solid crystals of inorganic matter. This is due to their acting as protective colloids and dispersing agents, which form a reversible gel in combination with the embryonal crystal of colloidal size instead of the solid crystal of inorganic matter.

There are two types of colloids. The lyophobic colloids or suspensoid sols show a more uniform behavior than the lyophilic ones and will be described first. Their most common and most striking characteristics are sensitiveness to electrolytes and the existence of a difference of electric potential between the surface of the particles and the surrounding liquid; the consequence being that in an electric field they move towards one pole. This phenomenon is known

as cataphoresis. The existence of the electric charge at the surface of the particles is necessary for the stability of the sol. By additions of electrolytes which occur in abnormal urine, the charges on the particles are neutralized. When neutralization is reached, the sol becomes unstable and precipitates. Multivalent cations such as magnesium and phosphorus cause precipitation more readily than univalent cations. The particles which did not collide while charged, now come into collision, adhere to another and finally form aggregates large enough to settle out.

One of the chief characteristics of the lyophilic class of colloids is that they are little affected by low concentrations of electrolytes. There are two factors which maintain the stability of the lyophilic colloids; electric charge and hydration, and both have to be removed to bring about precipitation. If a lyophilic colloid is added in small amounts to the lyophobic solution, it imparts to it an enhanced resistance to electrolytes or "protects it." Thus these are called protective colloids. Most lyophilic colloids in the human body are "protective" in nature. While seeking a protective colloid that was excreted in the urine, it was found that hyaluronidase (Wydase®) was not only highly capillary-active, but when mixed with physiologic saline and injected subcutaneously also appreciably acted to disperse minute particles suspended in the urine and prevented stone formation. This is due to the fact that naturally occurring protective colloids and physiologically increased amounts of protective colloids are set up to a gel, thereby preventing electrolytes present from crystallizing.

Hyaluronidase is an enzyme whose molecular weight has been estimated to be between 60,000 and 70,000. Oxidizing and reducing agents destroy its activity. The same holds for reagents which attack the carbonyl group. Hyaluronic acid, a substrate of the above-mentioned enzyme, is a linear or spiral polymer whose molecular weight has been estimated from 200,000 to 2,000,000. It is composed of alternating units of acetyl glucosamine and glucuronic acid (*Fig. 1*). Hyaluronic acid is a viscous mucopolysaccharide, which in animal tissue seems to bind with water in interstitial spaces, holding cells together in a jelly-like matrix. A mechanism is tentatively suggested by which hyaluronidase acts in increasing protective urinary colloids. Hyaluronidase releases hyaluronic acid at the site of injection, in this case the skin and subcutaneous tissue. The weakened barrier begins to reconstitute itself shortly after the hyaluronidase action has been dissipated. During the period of repair, excess hyaluronic acid or a substrate is present in the blood and is excreted in the urine. The effect of hyaluronidase in increasing protective urinary colloids, is an indirect one as the hyaluronic acid, or one of its products released, is excreted in the urine, thus acting as a protective colloid.

The clinical application of increasing protective urinary colloids by parenteral injection of hyaluronidase is a new concept in the treatment and prevention of renal lithiasis. The first nine patients selected for study had multiple, bilateral, rapidly recurrent renal calculi. They had passed numerous stones at fairly regular intervals over a period of years, and developed stones within a period of weeks or a few months. In these patients, no regimen of therapy had been effective in reducing the formation of stone before hyaluronidase therapy was instituted. Injection of 150 turbidity reducing units of hyaluronidase was regulated individually by observing the duration of increased colloidal activity after injection of the drug so that protective activity was maintained at an increased level. Each case was investigated regarding all known etiological factors as relates to stone formation. Four cases are summarized and only significant findings are noted. These patients have been on hyaluronidase therapy for from seven to eleven months. No new stone formation or growth of existing stones occurred while receiving this drug, as is evidenced by roentgenograms taken at thirty- to sixty-day intervals. Ultra-photomicrographs of urine specimens from these patients graphically illustrate the effectiveness of this therapy.

Case 1.—J. T. R., a man, age 42, had had symptoms of stone for fifteen years, and passed numerous stones composed of calcium phosphate and ammonium magnesium phosphate every three to six weeks. The degree of protective urinary colloidal activity was extremely low

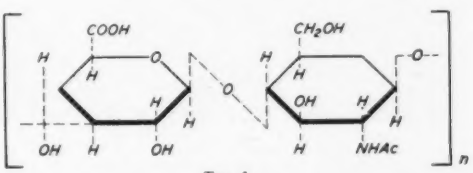

FIG. 1

Chemical structure of hyaluronic acid monomer.

(*Fig. 2*). Urine culture showed Staphylococcus aureus, non-urea-splitting. Roentgenograms revealed multiple, bilateral calyceal stones. Hyaluronidase therapy was instituted November 1, 1950. X-rays taken every one to two months revealed no new stones or enlargement of existing stones over a ten-month period. There were no symptoms except when he passed a stone following discontinuance of therapy for a period of four weeks.

Case 2.—H. G. S., a man, age 34, had had symptoms for seven years, and passed stones composed of calcium phosphate and ammonium magnesium phosphate at intervals of one to five months. The degree of protective urinary colloidal activity was extremely low (*Fig. 3*). Roentgenograms revealed innumerable, bilateral calyceal stones. Hyaluronidase therapy was instituted on October 2, 1950. X-rays taken at one- to two-month intervals revealed no new stones or growth of existing stones during the eleven months after therapy was instituted. Protective urinary colloids were maintained at an elevated level (*Fig. 4*). He passed stones on two occasions when therapy was discontinued for three weeks each time; otherwise, he has been asymptomatic.

Case 3.—B. W. W., a woman, age 50, had had symptoms twenty-five years, and had passed stones composed of calcium phosphate at intervals of one to three months. Roentgenograms revealed innumerable, bilateral calyceal stones. The serum calcium was 14.2; serum phosphorus 1.9; twenty-four hour urine calcium 1.1 grams per cent and the protective colloidal activity of the urine was reduced (*Fig. 5*). She refused operation on the parathyroid adenoma. Hyaluronidase therapy was instituted December 12, 1950. X-rays taken at three- to four-week intervals revealed no new stones or growth of existing stones after therapy was begun. Urinary protective colloids were maintained at an elevated level (*Fig. 6*). She has passed no new stones, and has been free of symptoms since institution of treatment.

Case 4.—A. T., age 25, a white woman, had had symptoms for five years. Following poliomyelitis with complete paralysis below approximately C 6, x-rays revealed rapidly developing stones in both kidneys. Urine culture showed mixed infections (non-urea-splitting). The protective colloidal activity of the urine was low (*Fig. 7*). A large calcium phosphate and ammonium magnesium phosphate stone was removed suprapubically from the bladder. The patient became pregnant and the

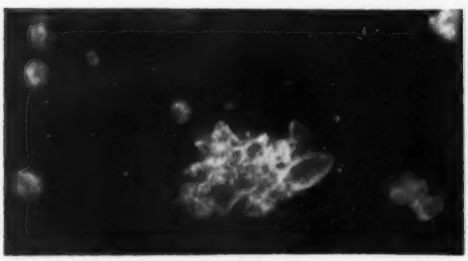

FIG. 2

Ultropak microscope X 2500. Beginning of kidney stone formation by crystallization of urine in white man with rapidly forming bilateral calyceal stones. Note absence of protective colloids surrounding crystals.

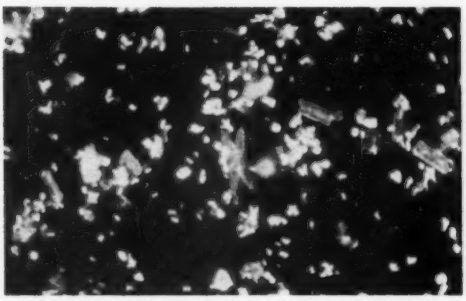

FIG. 3

Ultropak microscope X 2500. Start of crystal formation in urine of white man with rapidly recurring, bilateral calyceal stone formation. Innumerable micelles are present. Note absence of protective colloids surrounding micelles and crystals.

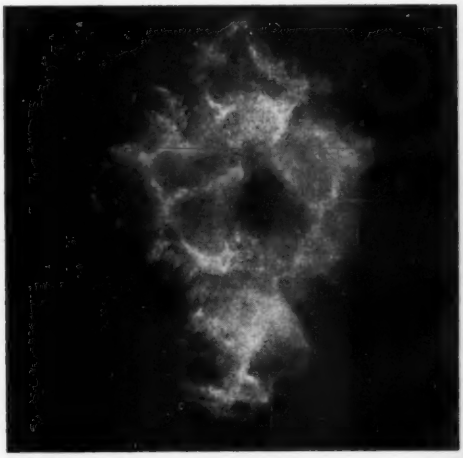

FIG. 4

Ultropak microscope X 2500. Deposit in urine of same patient (*Fig. 3*) thirty minutes following parenteral injection of hyaluronidase. This picture clearly demonstrates that he is now forming in his urine only highly solvated gel clusters which will readily redisperse when diluted.

FIG. 5

Ultropak microscope X 2500. Urine sediment from patient with hypercalcemia and hypercalcuria due to hyperparathyroidism. Note the innumerable ultramicroscopically-sized embryonal calculi. There is almost complete absence of protective colloids surrounding the particles.

growth of stones ceased during pregnancy. Urinary colloidal activity was elevated during pregnancy (*Fig. 8*). Following delivery, the stones enlarged rapidly. Hyaluronidase therapy was instituted September 5, 1950. X-rays taken every ten to thirty days revealed no new stones and no enlargement of existing stones. With parenteral hyaluronidase therapy and catheter irrigation of the renal pelves, approximately 85 per cent dissolution of the stones was accomplished in three weeks. Irrigation was frequently discontinued because of pain. Maintenance therapy of hyaluronidase was continued. Urinary protective colloids were sustained at an elevated level. There has been no new stone or growth of existing stones during the past twelve months.

The colloidal viewpoint will not of itself settle all questions related to kidney stones, but it will serve to clarify them and to provide a fresh and flexible means of interpretation and utilization. The role of urinary protective colloids in the etiology and prevention of renal lithiasis, is correlated with generally accepted factors important in calculus formation.

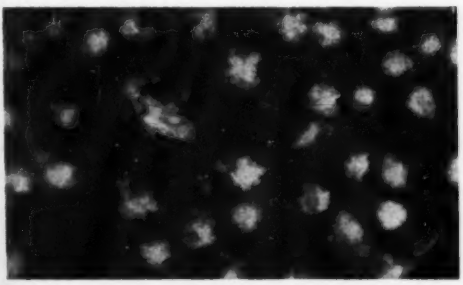

FIG. 6

Ultropak microscope X 2500. Urine sediment from same patient as *Fig. 5* one hour following parenteral injection of hyaluronidase. Note that the normally occurring and physiologically increased protective colloids are set to a gel, surrounding the crystals. There are no embryonal stones present and further crystallization and conglomeration are thereby prevented.

FIG. 7

Ultropak microscope X 2500. Beginning of stone formation in patient who has rapidly developed bilateral renal calculi following almost complete paralysis from poliomyelitis. Note the almost complete absence of protective colloids surrounding the crystalline stone.

STASIS AND INFECTION

Urostasis, *per se*, does not directly cause calculus formation. Poor drainage is one of the greatest factors in maintaining infection and consequent genesis and growth of stones. The effects of infection damage the epithelial lining of the urinary tract. This results in the appearance of large quantities of pathogenic colloidal material (degradation products of pus, erythrocytes, bacteria and exudates) in the urine. There is increased agglutination of bacteria. Stasis induces fermentation of urea, leading to ammonium production, alkaline reaction, precipitation of certain electrolytes. Pus and exudates of bacterial origin, aside from nephritis, are the most common sources of foreign colloids in the urine. Thus infection constitutes the commonest factor by which a normal protective mechanism will be upset.

Introduction of pathologic colloids into the urinary stream is increased with any inflammatory reaction, but stone formation does not necessarily follow. If this were the case, infection, with or without obstruction, would constantly be associated with urolithiasis. There are sufficient protective colloids present in the normal individual to prevent the development of stones of clinical significance. When pathologic colloids are being precipitated and agglutinated by infection, the protective colloidal mechanism normally present may be exhausted.

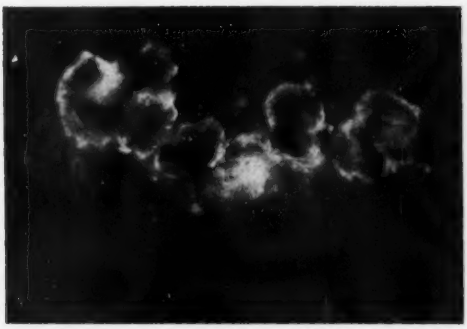

FIG. 8

Ultropak microscope X 2500. Urine sediment from same patient as in *Fig. 7*. Patient is now four and one-half months pregnant and renal calculus formation has ceased during pregnancy, as is evidenced by x-ray studies. Note the excellent protective colloid covering of the crystal. Further stone formation is greatly retarded or prevented.

Also of importance is the fact that bacteria readily digest colloids, thereby further decreasing some of the protective elements. The hydrogen ion concentration of the urine, is a highly important factor. When electrolytes react with alkaline substances in the urine, a "floc" is formed. This "floc" slowly sinks and carries a large part of the suspended solids with it. This effect takes place in two steps: first, neutralization of the protective colloidal particles; second, "floc" formation which acts to entangle the suspended particles, thus forming a mass which gravitates to the bottom. When the electrical potential is reduced to the isoelectric point, the particles precipitate and may form a nidus of a stone or may be added to a pre-existing nucleus or calculus.

VITAMIN A DEFICIENCY

In some cases, there is a close relationship between the formation of urinary calculi and deficiency of vitamin A. Lack of A, the epithelium protecting vitamin, leads to deterioration of epithelial cells and eventually to keratinization which involves a profound alteration of the urothelium. It was originally believed that the mechanism by which vitamin A deficiency produces calculus formation was that keratinized detritus formed a nidus on which a stone might develop. There is little proof that the desquamated cells give rise to such nuclei. Joly[34] said,

> "I believe that vitamin A starvation acts primarily on the renal epithelium and through it on the colloidal mechanism in the urine. Once this mechanism is deranged, stone formation must follow as a direct result of the laws of physical chemistry."

Higgins[35] noted that alkalinuria was consistently found in rats maintained on a diet deficient in vitamin A which he thought suggested the possibility of the relationship of colloids, colloidal suspensions, and crystalloids in the formation of urinary calculi.

Fujimaki[36] observed that animals fed on a vitamin A-deficient diet, develop not only bladder and kidney stones composed of calcium phosphate, but that they also develop biliary calculi which are composed of cholesterol in addition to calcium salts and pigments. This would indicate that there is derangement of some common protective mechanism such as the protective colloidal mechanism with subsequent calculus formation in these two physiologically different parts of the body.

Fox[37] determined that the diet of the South African Negro has a high vitamin A content. Our observations concerning the diet of Negroes in west Florida confirm these findings. As the South African Negro is immune to stone and the west Florida Negro is relatively immune to stone, this would indicate possible correlation between adequate vitamin A intake and increased protective urinary colloids.

RANDALL PLAQUES

To a large degree, stability of the urinary colloids depends upon the integrity of the lining of the urinary tract. Loss of smoothness from alteration of the urothelium brings about colloid precipitation and aids in the adherence of sediment to the lining, thus preventing its evacuation. Quite often necrotic plaques, especially when calcified, act as nuclei. The growing concretions may be initially adherent and later become disengaged after they are too large to pass from the urinary tract. Processes of this kind occur below the epithelium of the renal pyramids. They are common after childhood, and their incidence increases with aging. These calcium deposits converge near or on the tip of the papilla where they protrude, rendering the surface rough and irregular. Randall[19] has shown that these plaques exert pressure on the overlying epithelium which eventually disappears, leaving the calcified plaque in free contact with the urine. He has demonstrated the development from the subepithelial plaque to minute calculi attached to the pyramidal wall. This formation of nuclei within the wall and their migration into the lumen undoubtedly plays an important role in the development of certain renal calculi. Anderson and McDonald[38] found that microscopic calculi were present in all kidneys studied by them. If these tiny concretions are present in most or all individuals, why do they not all develop stones of clinical size? The answer probably lies in the fact that most persons have sufficient protective colloids to prevent precipitation of salts and other colloids on the active surface which the plaque presents. Vermooten[17] observed that calcium deposition on the renal papilla occurs in the South African Negro in a form indistinguishable from that seen in the Caucasian as described by Randall.[19] He found that although the Negro forms plaques, renal calculi are not deposited on them. He concluded that precipitation of urinary salts on the calcium

plaques must have a dietary or metabolic controlling factor. Our observations that the Negro race has an abundance of protective urinary colloids would explain the reason why, although plaques are present, the black race rarely develops calculi.

SUMMARY AND CONCLUSIONS

Urine is a highly saturated solution due to the presence of certain colloids. The protective action of urinary colloids is of major importance in preventing precipitation, agglomeration and conglomeration of crystalloids from a supersaturated solution.

If the concentration of protective colloids is insufficient, stone formation begins or is accelerated. In 680 subjects, the incidence of stone was found to be almost inversely proportional to the degree of protective urinary colloids present.

Parenteral injection of hyaluronidase pronouncedly increases the protective urinary colloids. The colloids are caused to set up to a gel, thereby preventing electrolytes present from crystallizing. They act as excellent dispersing agents and prevent the formation of stone.

Hyaluronidase therapy has been effective in preventing calculus formation or reformation over a period of nine to twelve months in nine patients who had previously been rapid stone formers.

The role of protective urinary colloids in the etiology and prevention of renal lithiasis is correlated with generally accepted factors important in calculus formation.

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DISCUSSION (*Abstract*)

Dr. Vincent Vermooten, Dallas, Tex.—For more than twenty-five years colloidal suspension of salts in the urine have been mentioned in association with the formation of urinary tract alkali but this is the first time to my knowledge that it has actually been demonstrated. The first glimpse of this extremely important subject should bring forth a tremendous amount of research which will in all probability result in a much more intelligent understanding of the formation of urinary calculi. Dr. Butt's studies give me the first logical and reasonable explanation as to why I was unable to

find calculi in the purebred Negro in South Africa when in the United States urinary calculi in the Negro, although of definitely lower incidence than that of the Caucasian, does occur. This is consistent with the fact that a fair per cent of the Negro population in the United States has some admixture of white blood, for in the mixed races of South Africa, part white, black or Malayan, the incidence of renal calculi is for practical purposes the same as that found in the white race.

One point in Dr. Butt's paper cannot be overemphasized, and that is his observation that the tendency to form stones in an individual who is a stone-former is very greatly enhanced if the individual has been given hyaluronidase and then later has it withdrawn.

Dr. Charles C. Higgins, Cleveland, O.—There are two essential prerequisites for calculus formation, namely, the presence of crystalloids and colloids. Both crystalloids and colloids are to be found in the analysis of calculi.

Ebstein, Schade, Lichtwitz and others have stressed the role of the colloids in calculus formation.

According to Ebstein, calculi contain a framework of albuminous substances. Lichtwitz noted that on an average 0.83 grams per liter of colloid is present in the urine. He observed a pronounced increase in the nonalbuminous colloids in acute or chronic inflammations of the kidneys.

The colloids obtained by dialysis are a mixture of a large number of substances of which mucin, nucleic acid, chondroitin-sulfuric acid, glycogen, and a complex nitrogen containing carbohydrate was found. The role of the protective action of the urinary colloids has been stressed for a considerable period of time, and it is generally accepted that if the concentration of such protective colloids is insufficient, stone formation may occur.

Now Dr. Butt has demonstrated that the subcutaneous injections of hyaluronidase causes a pronounced increase in the protective urinary colloids.

In our experimental laboratory, as many of you are aware, we have attacked the calculus problem from the standpoint of the crystalloids, minimizing the amount of crystalloids excreted in the urine by dietary means, and maintaining them in solution by controlling the pH of the urine.

THE ROLE OF RADIOLOGY IN THE DIAGNOSIS OF BRAIN TUMORS*

By ARTHUR B. SMITH, M.D.
Kansas City, Missouri

In the field of neuroradiology the radiologist has both a great opportunity and a great responsibility. He must constantly strive toward the detection of brain tumors at a stage when definitive surgical treatment can be undertaken. His experience in evaluating changes seen in plain roentgenograms of the skull, intracranial air studies and cerebral angiograms, and more recently in the field of isotope-fluorescein localization studies[1] should play an essential part in the management of the patient with an intracranial tumor.

What should the radiologist look for in the plain roentgenogram? Fifty per cent[2] of expanding intracranial lesions produce changes sufficient to localize them definitely or to arouse the examiner's suspicion. These, in order of their frequency, are:[3] (1) sellar erosions and deformities, (2) pineal displacement, (3) demineralization of the dorsum sellae, (4) calcification, (5) widened sutures, (6) increased digital markings, (7) sphenoidal fissure changes, (8) table changes (hyperostosis or erosions), (9) orbital bone changes, (10) enlarged internal auditory meatus, (11) petrous pyramid erosions, (12) choroid displacement, (13) displaced falx, (14) increased table vascularity.

Calcification occurs in the pineal more frequently than in other intracranial structures and study of its position[4] is often aided by stereoscopic views. Displacement of the pineal of more than 2.5 mm. from the midline indicates significant intracranial abnormality, usually space-occupying disease.[5,6] Marked change in the position of a well-calcified choroid must be considered suggestive of tumor[6,7] and most of the lesions causing such displacement are posterior to the choroid or in the temporal lobe. Displacement of the calcified falx by space-occupying lesions is infrequent.[6]

Calcification[8] within the substance of a tumor accurately localizes it and in some cases enables one to determine the type of tumor. Meningiomas (*Fig. 1, A, B*) frequently show a rather homogeneous diffuse calcification, well circumscribed, in contrast to the feathery, streaking or flocculent distribution of calcium seen in the slower growing gliomas (*Fig. 2, A, B*). Seventy per cent of craniopharyngiomas show calcification, and calcification in the walls of an aneurysm or angioma must be differentiated at times from tumor.

In evaluating petrous bone changes, too much significance must not be placed upon petrous ridge deformation outside the location of the porus acusticus.[9] Slight normal depressions may be found on either side, more frequently on the right.

Dr. Dandy,[10] whose pioneer work in ventriculography is known over the world, said as

*Read in Section on Radiology, Southern Medical Association, Forty-Fifth Annual Meeting, Dallas, Texas, November 5-8, 1951.

early as 1920 that "with experience and care in the use of ventriculography I believe few tumors will escape accurate localization." Thirty-one years later the problem is still a difficult one, despite improvement in technics and methods. It should be self-evident that ability properly to interpret the abnormal in the encephalogram or ventriculogram depends upon familiarity with the normal appearance of the intracranial contents. The work of Dyke[11] in the field of normal encephalographic anatomy is outstanding. The concept of the ventricular system and its associated spaces as a series of fluid-filled cavities into which air can be introduced only by displacing some or all of the fluid has proved of considerable value in interpreting changes seen and in securing an adequate roentgen study.[12–14]

Neoplasms of the frontal lobe in the advanced stages produce collapse of one or both lateral

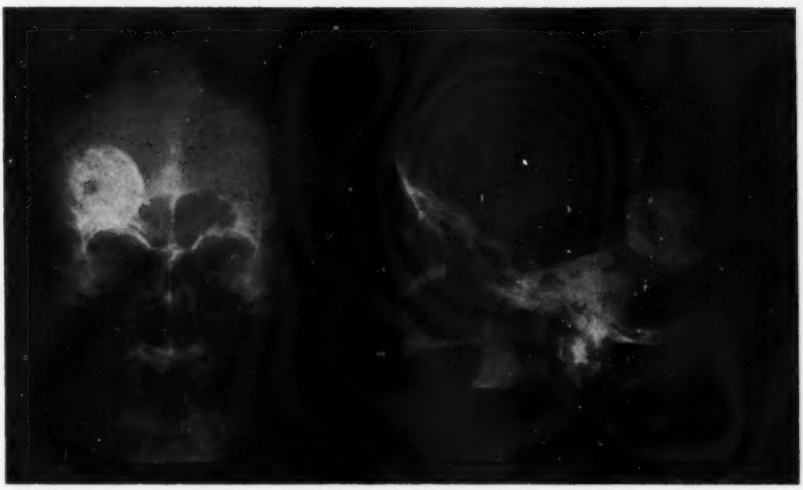

FIG. 1

T. N., a white man, with a meningioma of the occipital lobe. (A, left) The anteroposterior view shows the mass in the occipital lobe with the pattern that of a meningioma. (B, right) Lateral view shows a diffusely calcified mass with well-defined borders in the occipital region.

FIG. 2

L. D., a white man, with an oligodendroglioma of the left frontal lobe. (A, left) The anteroposterior projection shows linear irregular streaks of calcification such as are found in the slower growing gliomas. (B, right) In the lateral view a calcified mass is seen in the left frontal lobe.

ventricles, whereas in the earlier stages they produce unilateral ventricular collapse with a shift of the ventricles to the side opposite the tumor, or they may indent or distort the anterior horn of the lateral ventricle.

Neoplasms of the temporal lobe produce collapse of one or both lateral ventricles, but they more often result in unilateral collapse of a lateral ventricle with contralateral hydrocephalus. Occasionally the inferior horn may be elevated or depressed depending on the position of the tumor.

Neoplasms of the parietal lobe produce collapse of the lateral ventricles, similar to growths of the temporal lobe, except that the body of the ventricle more often is collapsed and a shift of both ventricles toward the side opposite the tumor results (*Fig. 3, A, B*).

Neoplasms of the occipital lobe produce ventricular distortion similar to those of the frontal lobe, except that the posterior and inferior horns of the lateral ventricles are distorted. They are much more frequently associated with hydrocephalus of the contralateral ventricle.

Neoplasms of the third ventricle, resulting in a block of the cerebrospinal fluid, produce dilatation of both lateral ventricles and may produce dilatation of the anterior chamber of the third ventricle. In the anteroposterior view the lateral ventricles are usually distinctly dilated and the third ventricle is only faintly visible or completely obliterated.

Neoplasms of the lateral ventricle and choroid plexus produce filling defects characteristic of the outline of the tumor and may be associated with dilatation of the ipsilateral, as well as of the contralateral, ventricle.

Neoplasms of the basal nuclei usually produce dilatation of the lateral ventricles, partial or complete obliteration of the third ventricle, and indentation of the posterior horn and body of the lateral ventricles depending on the position of the tumor.

Neoplasms of the hypophysis,[15 16] which elevate the floor and extend into the third ventricle, produce dilatation of the lateral ventricles with obliteration of the third ventricle. The lateral ventricles are usually flattened on the inferior surface and may be separated. In encephalograms of suprasellar tumors the characteristic findings are obliteration of the cisterna chiasmatis, diminution of the frontal cerebral subarachnoid spaces, an antero-inferior filling defect in the third ventricle, and filling defects in the floors of the anterior horns of the lateral ventricles. Conversely, visualization of a normal chiasmal cistern is sufficient to exclude the possibility of a suprasellar tumor.

Neoplasms of the corpus callosum produce partial collapse, indentation and separation of the lateral ventricles.

FIG. 3

Mrs. H., a white woman, had a metastatic carcinoma of the parietal occipital region, primary bronchogenic. (A, left) In the anteroposterior view there is displacement of the ventricles to the left, depression of the body of the right lateral ventricle and dilatation of the left lateral ventricle. (B, right) A lateral view shows a large filling defect in the body and posterior horn of the right lateral ventricle.

Neoplasms of the pineal body produce dilatation of the lateral ventricles, with distinct separation and indentation of the mesial surfaces of the posterior horns. Supratentorial tumors involving the posterior part of the third ventricle and thalamus must be differentiated from subtentorial tumors. Characteristically, these midline lesions deform the posterior quadrant of the third ventricle and usually obstruct the anterior portion of the aqueduct without displacing these structures to either side of the midline. Tumors of the quadrigeminal plate[17] produce straightening and deformity of the posterior wall of the third ventricle, symmetrical hydrocephalus, forward displacement and straightening of the aqueduct.

Tumors[18] arising to one side of the midline in close proximity of the posterior portion of the third ventricle produce unilateral deformity of the ventricular outline; displacement of the posterior portion of the third ventricle away from the tumor side; compression of the body of the lateral ventricle on the affected side and elevation of its floor; downward displacement of the temporal horn on the affected side and partial effacement of the vestibule when lateralized tumors reach large size.

Lesions of the posterior fossa produce internal hydrocephalus with dilatation of the lateral and third ventricles without displacement.

True aqueduct tumors are exceeding rare.[13] The only ventriculographic sign of such a tumor is severe, generalized hydrocephalus anterior to the point of aqueduct obstruction. Equally effective blockage of the aqueduct can be produced by a variety of more distant subtentorial tumors.

Intrapontine tumors[19] displace the aqueduct and fourth ventricle upward and compress them as well but do not produce hydrocephalus. Lateralized tumors of the pons and cerebellopontine angle tumors displace these structures to the opposite side. They may produce obliquity of the fourth ventricle simulating a shift. The third ventricle, when affected by neoplasms in the region of the pons, is involved in its inferior portion only. Unusually extensive tumors may involve structures in the middle fossa or displace the brain stem anteriorly, producing corresponding alterations in the appearance of the lateral and third ventricles.

The majority of the posterior fossa lesions are midline cerebellar tumors. As stated previously, they produce marked internal hydrocephalus without shift of the lateral or third ventricles. The fourth ventricle may show a filling defect or be completely obliterated (*Fig. 4, A, B*).

Cerebral angiography[20] is less hazardous than ventriculography and increased intracranial pres-

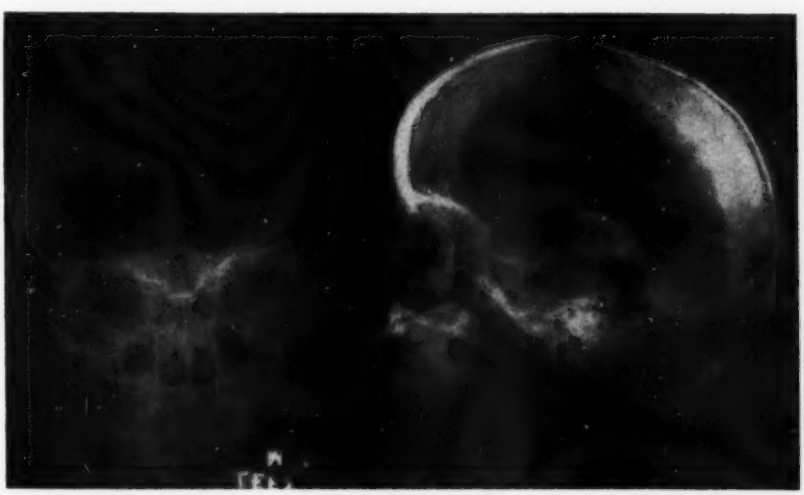

FIG. 4

L. D., a white man, with an astrocytoma of the fourth ventricle. (A, left) The anteroposterior projection shows dilatation of the lateral and third ventricles without displacement due to a midline cerebellar tumor. (B, right) In the lateral view is seen a filling defect due to a tumor mass on the floor of the fourth ventricle.

sure does not contraindicate its use as it does encephalography. It was first used by Egas Moniz of Lisbon in 1927. From 1927 to 1931 he used either 70 per cent strontium bromide or 25 per cent sodium iodide solution. Some deaths occurred following the procedure and in 1931 he changed to thorium dioxide which he has used since with no untoward effects. Others feel, however, that with the percutaneous method the possibility of extravasation about the vessel is a definite contraindication to the use of thorium dioxide and prefer the absorbable contrast media such as iodopyracet or urokon.® With the open method of angiography, thorium dioxide[21] can probably be used without danger if the total amount injected is less than 30 cc.

Carotid angiography[22 23] is equal or superior to ventriculography in certain expanding lesions of the base of the brain and skull; in space-occupying lesions of the cerebral hemisphere already grossly localized or lateralized by other methods; in differential diagnosis of neoplasm versus vascular lesion, especially aneurysm or vascular malformation. It is inferior to ventriculography in cases of increased intracranial pressure without localization; in tumors of the ventricular system, basal ganglia, mid-brain and posterior fossa (consider vertebral angiography). All of these lesions occur deep in the brain structures.

Extradural tumors of the sphenoid bone or pituitary adenomas elevate and displace laterally the extradural (parasellar, intracavernous) portions of the internal carotid artery. Parasellar tumors, often meningiomas, flatten and depress the extradural portion of the carotid artery and elevate and displace antero-medially the intradural supraclinoid segment of the carotid. Suprasellar tumors likewise elevate the supraclinoid portion of the carotid but in contrast to parasellar tumors tend to displace the vessel laterally and to displace the first segment of the anterior cerebral artery upward and slightly laterally.

In tumors of the posterior fossa, particularly extramedullary lesions of the ninth, tenth, eleventh, and twelfth nerves, vertebral angiography has some value.

Elevation of the sylvian vessels is the pathognomonic sign of tumors of the temporal lobe,[24] and in our experience this is a most reliable finding. Anterior temporal lobe tumors elevate the supraclinoid segment of the carotid and the first segment of the middle cerebral artery in addition, while posterior temporal lobe tumors do not deform the carotid siphon.

Tumors of the occipital lobe have less characteristic signs as most of the blood supply is from the vertebral system through the posterior cerebral artery, only occasionally demonstrated by carotid injection. Moderate elevation and forward crowding of the angular and posterior temporal arteries may be seen with the terminal branches of these vessels spread and distended.

The most characteristic sign of a unilateral frontal lobe tumor is the displacement and localized stretching of the anterior cerebral artery to the opposite side (*Fig. 5, A, B*). These lesions are divided for angiographic description into the subfrontal, prefrontal, premotor and frontotemporal tumors.

The subfrontal tumors are mainly olfactory groove meningiomas. Prefrontal tumors consist mostly of astrocytomas and meningiomas. The premotor tumors are astrocytomas, oligodendrogliomas and meningiomas. In the frontotemporal region occur meningiomas of the lesser sphenoidal wing, glioblastomas and diffuse astrocytomas.

Parietal lobe tumors depress the sylvian vessels and pericallosal artery. In the superior parietal region are the parasagittal meningiomas and gliomas, while the majority of inferior parietal tumors are glioblastomas.

Downward and posterior displacement of the anterior choroidal artery is almost a pathognomonic sign for thalamic neoplasm. In certain tumors of the basal ganglia the anterior cerebral artery describes an unusual forward and upward bulge.

Certain of the intracranial neoplasms show a sufficiently characteristic vascular pattern[20 25] that the type of tumor may be determined preoperatively.

Angiomas are mostly arteriovenous malformations consisting of one or several enlarged tortuous arteries leading to a tangle of smaller vessels from which emerge one or more dilated and redundant veins. The entire malformation is shown during the arterial phase of angiography and there is never displacement of adjacent normal vessels.

The blood supply to the meningiomas is from both the external and internal carotid systems. The angiographic appearance of the tumor vessels resembles a paintbrush, flower spray, or the end-arborizations of a nerve in the motor end plate. A typical feature is the diffuse opacification of the tumor due to a special vascular network of capillary size vessels. Cortical arteries in contact with the tumor appear to be distended and separated from one another, whereas the arteries of the adjacent compressed brain are crowded together and form a concentrically arranged corona around the lesion.

The glioblastomas have a pathognomonic vascular pattern but it occurs in only 50 per cent of cases. There are two types: (1) an irregular network of fine crisscrossing vessels with a few larger sinusoids, which resembles roentgenographic appearance of normal lung but is more irregular and spotty; (2) a very coarse bizarre vascular pattern which resembles an arteriovenous malformation. There is always displacement of adjacent normal vessels by the bulk of the tumor (*Fig. 6, A, B*).

The astrocytomas diffusely infiltrate the white matter, show tendency to interstitial liquefac-

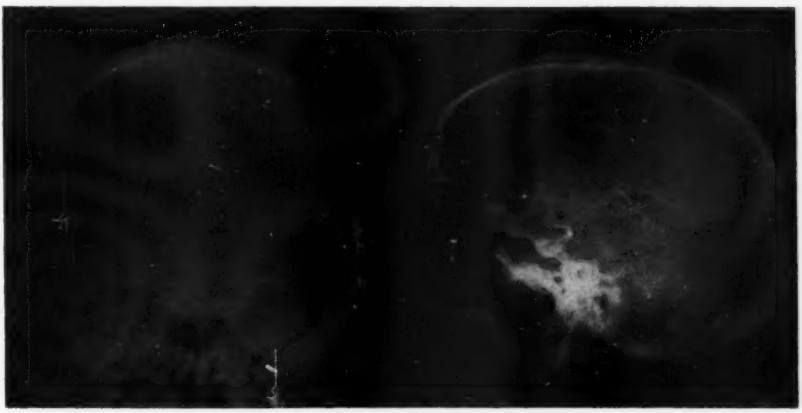

FIG. 5

H. H., a white man, had a glioblastoma of the right frontal lobe with associated hemorrhage. (A, left) In the anteroposterior view the left anterior cerebral artery is displaced laterally by the tumor mass in the right frontal lobe. (B, right) Cerebral angiography, lateral view. Both anterior cerebral arteries are filled and displaced posteriorly.

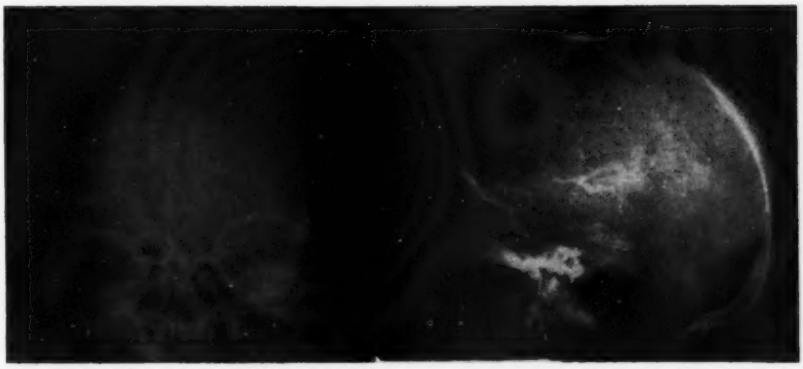

FIG. 6

M. S., a white woman, had a glioblastoma multiforme in the parietal temporal region. (A, left) Cerebral angiogram: the anteroposterior view shows a mass of abnormal vessels typical of a glioblastoma lying in the parietal temporal area. (B, right) Cerebral angiogram: the lateral view shows an irregular tangle of dilated vessels with displacement of the adjacent angular and posterior temporal arteries.

LOCATION OF TUMOR	CHARACTERISTIC FINDINGS	
	Pneumographic	Angiographic
Frontal lobe	Anterior horn distorted. Ventricles shifted to opposite side from tumor	Localized stretching and displacement of anterior cerebral artery to opposite side
Temporal lobe	Unilateral ventricular collapse with contralateral hydrocephalus; depression or elevation of the inferior horn; displacement to opposite side from tumor	Elevation of the sylvian vessels
Parietal lobe	Collapse of the lateral ventricle involving chiefly the body; displacement to opposite side usually less than with temporal lobe tumors	Depression of sylvian vessels and pericallosal artery
Occipital lobe	Distortion of posterior and inferior horns and hydrocephalus of contralateral ventricle	Elevation and crowding of angular and posterior temporal arteries with terminal branches spread and distended
Third ventricle	Dilatation of lateral ventricles; partial to complete obliteration of third ventricle	None
Lateral ventricles	Filling defects characteristic of outline of tumor; dilatation of one or both ventricles	None
Basal ganglia and Thalami	Dilatation of lateral ventricles; deformity of posterior wall of third ventricle; compression of the body of the lateral ventricle on the tumor side	Basal ganglia: forward and upward bulge of anterior cerebral artery. Thalamus: downward and posterior displacement of anterior choroidal artery
Hypophysis	Dilatation of lateral ventricles; elevation and obliteration of third ventricle	Elevation and lateral displacement of parasellar portion of internal carotid artery
Suprasellar	Obliteration of cisterna chiasmatis; antero inferior filling defect in third ventricle; filling defects in floor of anterior horns of lateral ventricles	Elevation of supraclinoid portion of internal carotid artery and displacement laterally; displacement of first segment of anterior cerebral artery upward and slightly laterally
Subtentorial	Dilatation of the lateral and third ventricles without displacement; fourth ventricle may show filling defect or be obliterated	Distortion and displacement of cerebellar arteries (very little angiography has been done in this region)

TABLE 1

tion and formation of cysts and have a relatively scanty blood supply. There is extensive stretching and spreading of the larger and medium-sized cerebral arteries and the finer arterial branches may be entirely absent. A special circulation is decidedly uncommon in astrocytoma.

Metastatic carcinoma may show increased vascularity resembling glioblastoma and the lesions may be multiple.

As a summary of this discussion *Table 1* lists the characteristic pneumographic and angiographic findings of tumors according to their location in the brain.

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DISCUSSION (*Abstract*)

Dr. Martin Schneider, Galveston, Tex.—Displacement of the calcified falx cerebri is quite rare, except in the presence of a very large expanding cerebral lesion. The position of the glomus of each choroid plexus has been described as lying 2.5 cm. from the midline in the "average" individual, but its position is inconstant or asymmetrical with the contralateral glomus in too many cases to be reliable. Even pedunculated glomus has been described (Malbin), shifting its position readily with changes in posture of the patient.

Attention should be directed to the appearance of the sphenoid ridge, best visualized in the anterior-posterior and Caldwell positions. Its importance stems from the changes that may occur in the presence of meningioma of this region, producing erosion, hyperostosis or both. Unfortunately, the left and right sphenoid ridges are frequently not alike in structure, and it is the differentiation between normal variations and pathologic changes that may be so difficult, as in other skull bones and markings. This problem is a good example of the need always to correlate roentgen findings with the other clinical information in each case.

It may be mentioned in passing that displacement of the calcified pineal body should be investigated in the lateral skull roentgenogram, as well as in the anterior-posterior and posterior-anterior views. Of the usual acceptable methods, use of the elastic tape markers seems satisfactory and convenient.

I believe that deformity of the temporal horn is of more than occasional importance. Changes of position, contour and size of the body, lateral and supra-cornual clefts will be found frequently in temporal lobe tumors. They must therefore be sought with adequate positioning of the patient for optimal filling and delineation of the inferior horn.

Evaluation of the midline ventricles and of the aqueduct of Sylvius cannot be overlooked; displacements, filling defects and dilatation above an obstructing lesion may be determinate findings in many cases of intracranial disease. Use of the Twining line and of the "Swedish" line is indispensable in detecting minor displacement of the fourth ventricle and of the aqueduct in the smaller tumors of the cerebellum and brain stem. I have noted with interest the reported accuracy of the "ventricular angle" method, described by Sutton recently; it would appear difficult to apply in air-contrast studies.

Finally, may I suggest that cerebral angiography is not a completely safe technic. Serious morbidity has been reported by most observers, in 1 to 2 per cent of cases. Information gained from the procedure may be invaluable in cases of intracranial vascular lesions, but the risk must be kept in mind to justify its use, at least with the contrast media now available. French investigators have reported animal experiments which indicate increasing permeability of the blood-brain barrier with successive injections of contrast medium. One might assume that pre-existing vascular disease, as in patients of the older age groups, may indicate relatively poor risks.

THE ROLE OF OCCUPATIONAL THERAPY IN THE PHYSICAL MEDICINE MANAGEMENT OF PHYSICAL DISABILITIES*

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Occupational therapy is a term that lends itself readily to multiple interpretations and definitions. A definition at best expresses the concept, experience, desires and hopes of the individual who presents it. Occupational therapy is regarded by some of its exponents as an art as old as man himself. By others it is looked upon as a twentieth century innovation.

Our discussion is limited to the use of occupational therapy in the treatment of physical disabilities. We employ the term physical disabilities to include diseases and conditions of the musculoskeletal and neuromuscular systems. We recognize that occupational therapy has much to offer in many phases of medical practice. It is deeply rooted and steeped in psychiatry and is essential for the proper and complete care of the psychiatric patient. It is closely associated with medicine and surgery. The tuberculous and the individual confined to bed for long periods of time are indirectly benefited by its intelligent application.

Mead and Harell** say that their paper entitled "Failures in Occupational Therapy" is meant to attract attention, to invite criticism, and if necessary to stimulate controversy. They raise the question of the therapist's ability as a craftsman and the conflict that may result between patient and therapist over choice of work and its com-

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Mead, Sedgwick; and Harell, A.: Failures in Functional Occupational Therapy. Arch. Phys. Med., **31: 753-756 (Dec.) 1950.

pletion. They suggest methods by which functional occupational therapy can be improved. We like to think that their stimulating presentation has aided us in our efforts to render the patient with physical disability a service that is, in our opinion, of definite value from the standpoint of more rapid and complete recovery.

PURPOSE AND AIMS OF OCCUPATIONAL THERAPY

When occupational therapy is prescribed in physical disabilities, there must be an end result that can be attained in a reasonable period of time. The primary purpose of treatment should be one or more of the following:

(1) To increase endurance.
(2) To improve coordination and dexterity.
(3) To improve muscle power and strength.
(4) To improve joint range of motion.
(5) To relieve tightness of fascial planes.
(6) To obtain best functional results.

Occupational therapy must be considered as a program of supervised activity, prescribed by a physician, for a definite purpose. Primary emphasis must be upon improvement of the condition of the patient and treatment is terminated when maximum benefit is attained. We believe that only those crafts and technics which provide a complete treatment service capable of producing good medical results should be available. Crafts and technics must be carefully selected because seldom do two activities accomplish identical results. This in itself minimizes a choice on the part of the patient and makes more definite the medical aims of treatment. An occupational therapy technic should appeal to the patient so that improvement in disability results without concentration on the disability itself. This appeal is possible without a multitude of technics and without free choice of activity which provide the hobby shop atmosphere that detracts from the dignity and effectiveness of medical practice.

THE PHYSICIAN AND THE OCCUPATIONAL THERAPIST

It is the duty of the physician who is responsible for the care of the individual who is physically disabled to:

(1) Examine the patient to determine whether or not occupational therapy is indicated.

(2) Determine the cause and extent of disability.

(3) Determine reversibility of the disease or condition.

(4) Prescribe a program of activity which defines the aims of treatment with specific instructions as to the segment to be treated, protection and support, precautions, resistance, and the duration of activity.

(5) Provide the occupational therapist with a brief history and physical findings along with prescription.

(6) Re-evaluate progress of the patient as a result of treatment at reasonable intervals.

(7) Frequently observe the patient while he is receiving treatment in the clinic or on the ward.

(8) Discharge the patient from treatment when maximum benefit has resulted or when improvement fails to follow a reasonable period of treatment.

It is the responsibility of the occupational therapist to:

(1) Select technics or crafts that will most readily and effectively produce the result desired by the physician.

(2) Grade the muscles of the involved segment and record the range of motion, tightness of fascial planes and substitution patterns at the beginning of the course of treatment.

(3) Maintain progress notes to show improvement, failure to improve, and any unusual emotional reactions that affect the motivation of the patient.

(4) Continuously supervise the patient under treatment with special attention to protection and support when ordered, muscle re-education, prevention of substitution, amount of resistance, and remain within the pain and fatigue tolerance of the patient.

(5) Instruct the patient as to equipment and methods necessary to carry out same type of activity program on the ward or at home, to accomplish results desired.

(6) Establish the best possible pattern of motion.

It is obvious that there is room in this field for both the physician and the therapist, each with his own duties and responsibilities commensurate, of course, with training and experience. We believe that both the physician and the therapist must be capable of evaluating muscle weakness, limitation of joint motion and

tightness of fascial planes. This implies a knowledge of muscle origin and insertion, nerve supply and root. It further implies a knowledge of muscle function and group action. We realize that the occupational therapist who has this training and ability is not too readily available, but without this basic capacity she is ill-fitted to meet the responsibilities that we have outlined. We adhere strongly to the opinion that the occupational therapist must have adequate training and experience in the evaluation of muscle weakness. This is a problem, however, for those who are responsible for the education of occupational therapists and is beyond the scope of this paper.

The trained and experienced occupational therapist should be given wide latitude in the care of the patient. She should be allowed to select and change the technics or crafts with, of course, the final medical result in mind. She must be guided by the prescription of the physician which, however, should not limit her initiative, continuous supervision, and good common sense. Frequently, time spent in the clinic or on the ward under the supervision of the occupational therapist is not sufficient completely to tax the capacity of the patient for improvement. In these cases, especially disabilities of the hands, the therapist should provide the patient with materials and instructions so that his program will be continued at frequent intervals during the day on his own initiative. The simplest method requiring the least equipment to augment the clinic program is the method of choice. The ultimate aim of occupational therapy is improvement of the condition under treatment and the physician, the therapist, and the patient must cooperate to that end.

TECHNICS AND CRAFTS

Any evaluation or critique of occupational therapy activities may well be prefaced by a statement of the considerations involved in determining the best possible treatment media.

(1) The aims of treatment in any given program will determine, to some extent, the craft technics and activities to be utilized. In a large general hospital, all six previously stated purposes and aims could best be accomplished only through the use of more varied technics, whereas a specialized treatment center could readily meet the occupational therapy needs of its patients with a limited program.

(2) Personnel to be employed will influence the quality and scope of the program. This will include the therapists, their knowledge, experience, and skills, and assistants whose experience and capabilities must be evaluated.

(3) The age group or groups and the type of patient to be treated should be carefully analyzed in any consideration of an activity.

(4) Optimum utilization of space must be taken into account when weighing the merits of one activity against another in a situation where space is limited.

(5) The financial resources of an institution will obviously affect the type of occupational therapy program which can be maintained.

With these five vital considerations in mind, it is our purpose, then, to discuss those activities which might well constitute an adequate and creditable program for treatment of physical disabilities in occupational therapy.

(1) *Weaving.*—By utilizing hand-operated looms (*Fig. 1*) adapted to the patient's needs, the aims of treatment for almost any upper extremity disability can be realized. Resistance may be attained through the use of springs; handles wrapped with rubber sponge provide size gradations as well as greater flexion, and dexterity may be improved by utilization of varying the weight and quality of material. If necessary, the hand loom may be altered to include active exercise for some lower extremity disabilities.

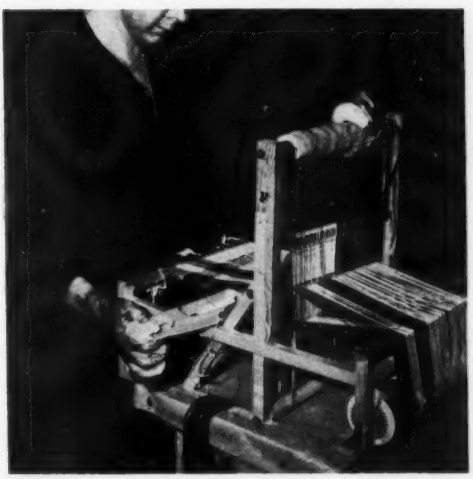

FIG. 1

Patient with full thickness burns, both hands, increasing flexion of fingers of both hands and stretching web spaces between thumbs and first fingers, both hands.

Foot-powered looms are important and effective in treatment of both upper and lower extremities. As with hand looms, the modifications are almost limitless and the mechanism simple.

Weaving, then, can be the answer to almost any problem presented to the occupational therapist in treating a physical disability. The potentialities of this craft as an occupational therapy activity far outweigh any possible disadvantage in a consideration of space allotment.

(2) Wood and plastic construction should employ hand- and foot-operated equipment such as the bicycle saw and treadle sander, as well as some power tools including a band saw, sander, and buffer, and hand tools which could be adapted to meet the patient's individual needs. These media, it is felt, could well be utilized to fulfill many treatment purposes, and are equally applicable to upper and lower extremities (*Figs. 2* and *3*).

(3) Metals, with their possible variance in weight and malleability, have a definite contribution to make to the therapeutic program for upper extremity disabilities. By its very nature, the metal project requires skillful, painstaking, and laborious motions, and with ingenious, yet proper adaptation of tools and size of project, desired results can be achieved (*Fig. 4*).

(4) Leatherworking, when wisely utilized, provides optimum treatment for many defects involving the intrinsic muscles of the hand. As with metal, the tools can be adjusted to the individual patient's needs, the material is variable, and the technics for accomplishing the project are limited only by the therapist's ingenuity. By comparison with metal, leather provides little resistance, and is most effectively used where the emphasis is placed on improvement of dexterity or coordination, increase in range of motion, and when functional training is paramount.

It seems fairly reasonable, then, to state that the above-mentioned modalities, when wisely utilized by an able therapist, will meet the demands of most functional treatment programs. Providing proper emphasis is placed on protection, support, and assistance to the affected part, the technics can be equally effective for bed patients and those who are able to attend the clinic. Care should be taken to insure correct

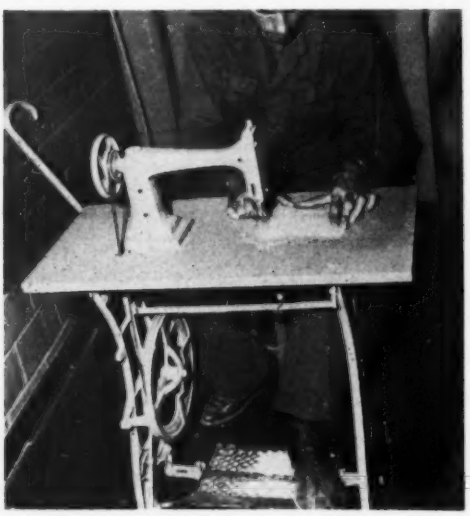

FIG. 2

Patient with fracture of left ankle working on treadle saw to increase ankle motion.

FIG. 3

Patient with right hemiplegia maintaining range of motion in shoulder and elbow through use of bilateral sand block and sling suspension.

FIG. 4

Patient with returning function of ulnar and median innervated muscles sawing silver metal with an adapted handle on jeweler's saw to increase muscle power and coordination.

patterns of motion, good posture, and natural working positions through the use of sling suspensions, working surfaces of adjustable heights, and equipment which provides the patient with every practical assistive device to obtain maximum benefit from treatment in the shortest possible time (*Fig. 5*).

The foregoing evaluation of activities should not be interpreted to be an all-inclusive panacea for functional treatment; rather, these craft modalities are offered as basic material. It is well recognized that some other technics could be included in the treatment program, depending, again, on the specific needs or specialties of the individual institution. It is recognized also that, in programs devoted primarily to teaching or improving daily skills, craft activities will be minimized in favor of technics involving basic patterns of movement to achieve optimum personal independence.

It is, therefore, the province and the responsibility of the physician to determine the ends of the treatment program; the means should be the duty of the therapist, who, with her knowledge, ingenuity, initiative, and skill, will strive toward the desired goals.

FIG. 5

Table cut out to admit patient in wheelchair. Table is adjustable in height; wheelchair or chair shown may be equipped with sling suspension.

DISCUSSION

Occupational therapy has its advantages and its limitations. The management of physical disabilities must be considered as only a part of a well coordinated program that utilizes all methods that aid in the complete and total rehabilitation of the patient. It is at its best in promoting endurance and coordination. When muscle groups are capable of light resistance, carefully graded occupational therapy technics will improve power and strength. When an increase in power and strength is the end result desired for muscles that can carry a load through a full range of motion, physical therapy and reconditioning technics are methods of choice. Occupational therapy may well be used in the treatment of lower extremity disabilities. Lower extremity muscles are soon beyond aid from these methods, however, because they are more massive and their patterns of motion are less complex than those of the upper extremities. Muscles that are not capable of voluntary capacity and those in early stages of re-education should not be treated in occupational therapy sections.

It is our opinion that all sections within the physical medicine service should be informed concerning the complete program of treatment of the patients that are referred to them. A method that we have found to be effective is to send a carbon copy of the history, physical findings, and treatment prescribed in physical therapy, occupational therapy and physical reconditioning to each section concerned. As a result, each therapist has adequate information concerning her patient and, in addition, knows what other treatments the patient is receiving. A carbon copy of any changes in treatment and copies of all progress notes entered on the chart are also sent to the section chiefs for the use of the therapists.

SUMMARY AND CONCLUSIONS

(1) Occupational therapy is a part of a coordinated program designed to offer the patient with a physical disability maximum assistance for his early and complete recovery.

(2) The program of activity is prescribed by a physician.

(3) The responsibilities of the physician and the therapist to the patient and each other are outlined.

(4) The basic technics and crafts best suited to treatment of disabilities are listed.

(5) Occupational therapy is not designed to provide heavy resistance therapeutic exercises.

(6) Occupational therapy should not be used when muscles are incapable of voluntary capacity or when early muscle re-education is in progress.

DISCUSSION (*Abstract*)

Dr. A. Ray Dawson, Richmond, Va.—There are many disadvantages to a widely scattered General Hospital such as ours (McGuire Veterans Administration Hospital, Richmond, Virginia) wherein we have and operate five large occupational therapy clinics, but such division does bring into clear focus the efficiency of occupational therapy in treating the tuberculous patient; the psychotic patient; the paraplegic patient; the medical, primarily the rheumatoid patient; and the orthopedic and neurological patients. The modalities used in these five clinics are particularly selected and adapted for the use of the classification of patients to be treated. Quite obviously, the modalities vary, but underlying the many activities found in the five clinics, is the objective, restoration of physical and mental function, never losing sight of emotional restoration and betterment.

As the authors have brought out, occupational therapy, like the majority of endeavors in physical medicine and rehabilitation, deals with disabilities. Therefore, we must first diagnose the disability, estimate our goal of restoration, then set about accomplishing this restoration. As in all medical practice, we must carefully evaluate the patient's restorative activities. We must change our prescriptions from time to time in accordance with needs. We must set up obtainable goals and stimulate the patient in his effort to reach them.

Again, I recommend strongly that we follow the lead of the authors of this paper in presenting discussions, having as their objective, bringing to the general medical profession the real value of occupational therapy, and thereby reducing some of the confused thinking which we run into daily.

PERITENDINITIS CALCAREA*

By EARL P. HOLT, M.D.
and
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Peritendinitis calcarea has been considered a clinical entity and described as such by Hitchcock[1] and by Key[2] in the American literature and by Sandstrom and Wahlgren[3] in the Swedish literature. There are many articles in the literature on calcareous deposits in specific areas, chiefly the subdeltoid area where the deposit lies within the fibers of the rotator cuff of the shoulder joint, but there are reports of depositions similar anatomically, biochemically and histologically in the long head of the triceps,[2] near the coracoid process,[2] about the elbow,[2] in the flexor carpi ulnaris,[4] in the capsule of metacarpophalangeal joints,[2] the capsule above the head of the fibula,[1] the quadriceps tendon above the patella,[1] in the knee joint capsule,[2 3] about the os calcis,[3] the greater trochanter,[3 5] the biceps,[2] the junction of sacrum and coccyx,[2] and in an interspinous ligament.[6] It is probable that deposits of calcium similar to these have occurred everywhere that the conditions prerequisite for such depositions have developed, but we have three locales to report which have not as yet been mentioned in the literature.

Case 1 (Barnes Hospital 190097, X-ray 285736, Surg. Path. 50-4847).—This 33-year-old white man was admitted to Barnes Hospital completely incapacitated by pain and tenderness over the posterior-lateral aspect of the right hip. These symptoms had developed insidiously over a 48-hour period. X-ray revealed a calcific deposit posterior to the trochanteric section of the femur. White blood count and temperature were within normal limits. A deposit of calcium with the consistency of toothpaste was excised from the quadratus femoris tendon and the underlying bursa. Recovery was prompt and complete. Histologic section showed hyaline degeneration of connective tissue of the tendon, an acute inflammatory response by the bursa, and granular deposition of calcium in the interstices (*Fig. 1, a, b*).

Case 2 (Barnes Hospital OPD 1-2-51-02873, X-ray 303509, Surg. Path. 51-4217).—This 51-year-old white woman "sprained her wrist" starting a power mower four weeks prior to examination. She had severe pain and exquisite tenderness over the volar aspect of the wrist joint of about one week's duration, and was unable to move her wrist or fingers and had been practically sleepless for several nights. X-ray revealed a calcific deposit on the volar aspect of the wrist near the capsule, and exploration revealed a deposit of calcium of creamy consistency, seemingly under pressure, situated exactly in the radiocarpal portion of the volar capsule of the joint. Relief was prompt and motion was almost completely restored in two weeks. Histologic section showed the same hyaline degeneration of fibrocytes with calcareous deposits that was seen in *Case 1* (*Fig. 2, a, b, c*).

Case 3 (Barnes Hospital 08842, X-ray 296048, Surg. Path. 51-4888).—This 53-year-old white housewife had three episodes of severe pain and tenderness over the ulnar aspect of the right wrist, the last episode beginning one week prior to surgery. Local heat, redness and pain on motion were noted. There was a slight persistent temperature elevation and the patient had been given penicillin for about five days. X-ray revealed a calcific deposit in the region of the ulnar collateral ligament. Exploration under local anesthesia revealed the usual

*Read in Section on Orthopedic and Traumatic Surgery, Southern Medical Association, Forty-Fifth Annual Meeting, Dallas, Texas, November 5-8, 1951.

*From the Department of Surgery, Washington University School of Medicine and Barnes Hospital, St. Louis, Missouri.

creamy white material from a tense cavity within the ulnar collateral ligament. Microscopic section showed hyaline degeneration of connective tissue fibers and amorphous calcareous deposits (*Fig. 3, a, b, c*).

Milch and Green[4] reported five cases similar to this with x-ray reproductions showing radiopaque material in this area. None of their cases was operated upon. They inferred that the deposits were within the flexor carpi ulnaris tendon. Comparison of these with our case operated upon leads us to believe that the depositions in their five cases were also within the ulnar collateral ligament or another portion of the wrist joint capsule. In our experience the peritendinous calcium deposits have never been found anywhere except in broad flat tendons or in ligaments or ligamentous portions of joint capsules. The tendons have subjacent or adjacent bursae or else overlie synovial capsules of joints. In our minds this implies a phylogenetic susceptibility of such tissues as an etiologic factor.

FIG. 1a, CASE 1

Lateral views of an amorphous calcareous deposit found to be in the quadratus femoris tendon at operation.

FIG. 1b

Photomicrograph of biopsy in *Case 1*, showing extreme degree of hyaline change in the connective tissue of the tendon with amorphous deposits of calcareous material in clefts and crevices of the tissue.

The incidence of this disease is pointed out by Key.[2] Suffice it to say for the sake of simplicity that in the Washington University Orthopedic Clinic it has been more common in the past five years than bone or joint tuberculosis or acute osteomyelitis.

It occurred to us in reviewing the literature that so-called "peritendinitis calcarea" had been inadequately emphasized as a true clinical and pathological entity, and that no attempt had been made to extricate it from a host of pathological calcifications and ossifications in soft tissues near and distant from joints. Furthermore, it seems to have been taken for granted since the publications of Leriche and Policard[7] that the fate of calcium deposits in body tissues is to turn to bone, and the implication is frequently met that the presence of calcium salts even acts as a stimulus to bone formation. Watson-Jones[8] says:

> "The view put forward by Leriche and Policard and advocated in this country by Greig, is that the only factor necessary to determine bone as the ultimate destiny of a mass of primitive mesenchyme is an excess of calcium with an adequate blood supply. By these factors the theory accounts for the development of bone not only in the skeleton but in abdominal scars, thoracic viscera, and other tissues. Any adult tissue which can be de-differentiated into primitive mesenchyme may be built up as bone if there is calcium excess. Pathological calcareous deposits in any region of the body may therefore change into pathological ossific deposits if the blood supply should become adequate."

None of our observations have in the slightest degree substantiated this belief, and evidence from the literature that a calcific deposit may turn to bone is extremely scanty. We think it no more likely for an amorphous deposit of calcium salts to become invaded by osteoblasts and to form bone than for a tree to grow up through a pile of bricks and result in a house.

The case of Nilsonne[5] reported in 1930 was mentioned both by Key[2] and Sandstrom and Wahlgren[3] in which a plaque of bone was found adjacent to a calcareous deposit at the tip of the greater trochanter. His patient was a 47-year-old white woman who fell to the pavement from a streetcar and developed pain in the hip which disappeared in a few weeks. Pain recurred in the hip after a year and became severe and incapacitating. A radiograph revealed a calcific

deposit near the tip of the greater trochanter. Operative removal of the deposit was performed and the patient was relieved. Microscopic examination showed hyaline degeneration of connective tissue with calcium deposits in layers around a plaque of bone. Dr. Nilsonne did not dwell upon the meaning of calcium deposits and mature bone which occurred in his specimen but seemed to take it for granted that this simply represented stages of the disease process and that the bone was developing within the calcium deposits. It seems more likely to us that since this is an almost unique finding in a common pathological process, there were two diseases present instead of one: that the bone developed in torn and elevated periosteum as a result of the fall with tearing away of the gluteal tendinous insertions, and that symptoms subsided with healing, but recurred with deposition of calcium in degenerated gluteal tendon fibers in the vicinity of the bony plaque. Interestingly enough, Goldenbert and Leventhal[9] who grouped subdeltoid calcification, calcification about the greater trochanter and Pellegrini-Stieda's disease together as a single pathological process, reported their only operative case of five cases of supratrochanteric calcification to show adult bone developing within cartilage. No calcareous deposits were present.

Reports of co-existent calcification and bone formation in the rotator cuff of the shoulder joint are rare. The only two such references we found were in the bibliography of Sandstrom and Wahlgren.[3] One by Haenisch[10] surmised the presence of bone from the appearance of some of his x-rays. We feel that this is inconclusive. The second, by Usland[11] in the Scandinavian literature of 1920 is entitled, "Bursitis Subdeltoidea Calcarea et Ossificans." At this writing it was unobtainable by us.

FIG. 2a, CASE 2

X-rays showing a deposit of calcareous material found in the radiocarpal ligament at operation.

FIG. 2b

The deposit of calcareous material from *Case 2* is shown issuing from the volar radiocarpal ligament at operation.

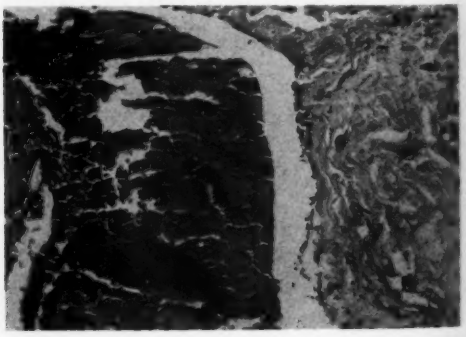

FIG. 2c

Photomicrograph of biopsy in *Case 2* showing hyaline changes in connective tissue and calcification similar to *Case 1*.

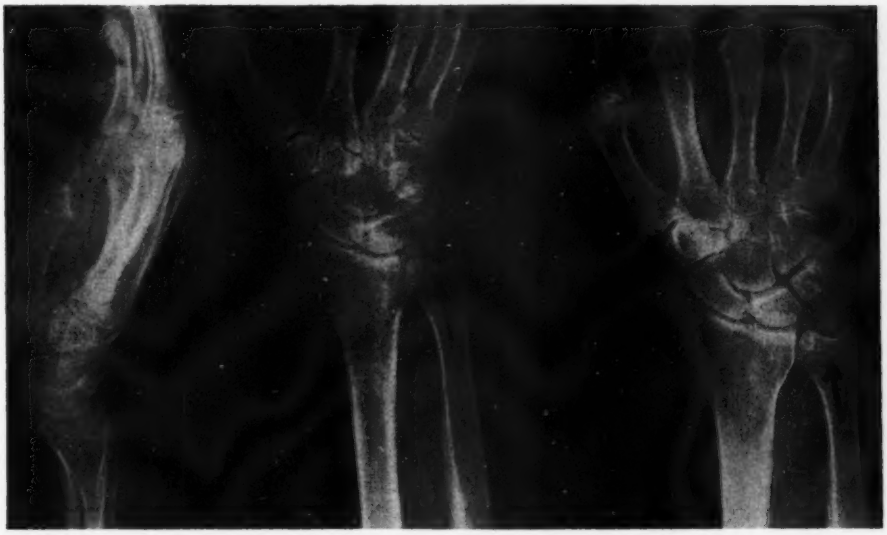

FIG. 3a, CASE 3

X-ray showing calcific deposit found situated in the ulnar collateral ligament of the wrist.

A number of instances of calcification in the tendo achillis following tenotomy have been noted. Watson-Jones[7] says that though eight cases of ossification of the tendo achillis have been described following subcutaneous tenotomy, the earlier stage of amorphous calcification has not been observed. Luck[12] says that there is no case reported of calcium deposition around the Achilles tendon. We have seen no instance of a calcareous deposit in the Achilles tendon and believe that bone formed there is a result of periosteal transplant from the calcaneus as a result of tenotomy, or else results from heterotopic ossification within a hematoma. We have a typical lesion of this sort in an adult who had subcutaneous tenotomy in infancy for club-foot deformity (*Fig. 4*).

Neither should ossification of the collateral

FIG. 3b

The calcareous material is shown escaping from the ligament at operation (*Case 3*).

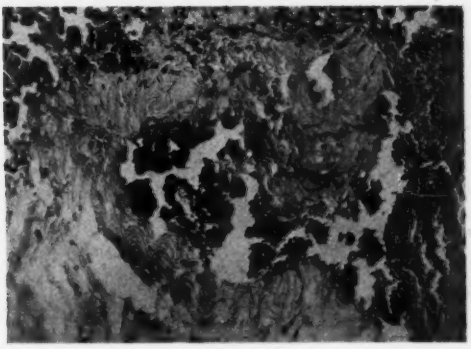

FIG. 3c

Photomicrograph of biopsy in *Case 3*, showing the usual hyaline changes of connective tissue and amorphous calcareous deposits.

ligament of the knee, the disease of Pellegrini and Stieda, be confused with peritendinitis calcarea about the knee joint. However, four standard texts vary in their concept of this point. Mercer[13] describes Pellegrini-Stieda's disease as resulting from trauma to the knee with the development of a nodule of new bone or calcium in the region of the medial condyle of the femur. The histological picture may consist of a deposit of lime salts among the fibers of the medial ligament, or may be composed of formed bone. He doubts that such deposits are the cause of much disability. Shands[14] says only that the disease is one with calcification of the tibial collateral ligament with deposits of calcium overlying the medial femoral condyle. Key[15] applies the term to calcification of the internal lateral ligament of the knee and admits to the possibility of avulsion of osteogenic tissue with the laying down of bone in the ligament. Watson-Jones[16] says that Pellegrini-Stieda's disease results from avulsion of the internal lateral ligament from the femur. Periosteum is elevated, and the subperiosteal hematoma undergoes ossification. Spicules, spurs or plaques of bone are formed. It does not differ from the ossification which occurs at the periosteal attachment of any ligament or tendon.

Nachlas and Olpp[17] reported 20 patients with calcification over the adductor tubercle of the femur. One of the patients had excision of the plaque. It was found to be a button-like piece of mature bone lying beneath a membrane that overlay the lower femoral condyle, and was situated between the insertion of the adductor magnus and the attachment of the tibial collateral ligament. The condition did not appear to be due to a fragment of bone from the femur, a tear of the periosteum, or a calcified bursa. We wish to emphasize the dissimilarity of this post-traumatic symptom complex with the two cases of calcification about the knee reported by Hitchcock,[1] one proximal to the head of the fibula, and the other in the quadriceps tendon; and the two cases reported by Key,[2] both over the medial collateral ligament; and the large deposit described by Sandstrom and Wahlgren[3] in the lateral portion of the knee joint capsule. All of these were characterized by intense pain and local tenderness, and yielded the greasy calcium paste on operation. Postoperative relief was prompt in each case. We have found no reports in the literature of co-existent calcareous depositions and mature bone in lesions about the knee joint. Ferguson[18] reported bone formation in the infrapatellar fat pad in an article on calcification in fat pads about joints. Histologic study of the material removed showed ossification to be occurring within cartilaginous masses, not within amorphous calcium deposits.

FIG. 4

An x-ray showing what appears to be mature bone in the tendo achillis. Trabeculae can be seen in this heterotopic bone. This patient had subcutaneous tenotomy of heel cord for club foot deformity in infancy.

The question concerning transmission of any calcium deposit to bone in other widespread areas of the body is not one that can be settled in this paper. We are extremely skeptical at present, but there are many reports in the literature in accordance with this notion made popular by Leriche and Policard.[7] It was their concept that any kind of connective tissue may become osteoblastic and produce the framework for absorption of minerals; also that connective tissue cells in the neighborhood of a calcareous deposit were capable of utilizing the minerals immediately. Fontaine, Mandel, Witz and Ostertag[6] studied 19 cases of pathological calcification biochemically and pathologically. In calcareous deposits they found calcium and phosphorus in ratio corresponding to bone but the percentage of nitrogen was less, indicating the relative absence of protein framework. Nine goiters showed calcified plaques and cholesteatomas without bone, but one substernal goiter with a large necrotic cyst was shown to have calcified plaques and a plaque of adult bone together in the specimen. The photomicrographic illustrations do not show

any definite relationship between these two pathological processes. Calcification of an interspinous ligament, pleura, pericardium, a dermoid cyst, a calcareous deposit in a patient with calcinosis, and two subdeltoid bursas were studied and showed no bone formation. Three calcified epitheliomas near to each other on the face of one patient showed bone formation in two of the three. A 30-year-old hematoma resulting from repeated injuries to the calf of the leg in a patient was found to be a cyst filled with milky fluid and calcareous masses. A single small plaque of bone was found in this cyst wall. Finally, a laparotomy scar in another patient showed mature bone without calcareous deposition. Their conclusions were that amorphous calcium deposition was not necessarily a terminal process in tissue breakdown but that the deposit was easily utilizable because its minerals, calcium phosphate and calcium carbonate, were already in the ratio in which they occurred in bone, and provided a storehouse, not a cemetery, from which the organism could take whatever it needed for elaboration of normal or heterotopic bone. They agreed exactly with the teachings of Leriche and Policard.

This brings up the question of the nature of heterotopic bone formation in general, and though the subject cannot be reviewed here, a word in passing is in order. The tendency for bone to form in hematomas is well known. Seeliger[19] studied organization in hematomas in soft tissues through stages to adult bone, and stated that he was unable to determine histologically whether ossification was due to osteoblasts from elevated periosteum or to osteoblastic activity of mesenchymal cells undergoing metaplasia. Huggins,[20] Neuhof[21] and Gomori[22] have demonstrated constant formation of bone in several mesenchymal tissues under influence of epithelium from the urinary tract and occasionally from epithelium of the gallbladder. Recently Gomori[22] demonstrated the role of phosphatase in the bone formation induced in fascia by renal epithelium. Phosphatase was demonstrated to appear in the fibroblasts adjacent to the renal epithelium as early as the sixth day. By the ninth or tenth day osteoid was present. At the end of a month well developed bone and hematopoietic marrow was present. He also demonstrated the appearance of phosphatase preceding calcification in necrotic tuberculomas, but found no evidence of phosphatase in hyaline connective tissues which were undergoing calcification. It is in the latter group of dystrophic calcifications, the calcifications of attrition, in calcifications in which there is now evidence that phosphatase plays no role, that peritendinitis calcarea belongs.

Barr[23] says that

> "Tissues involved (by calcification) are of widely different origin and chemical character and seem to have in common only the quality of homogeneity and physical appearance frequently resembling the hyaline cartilage in which new bones are formed."

Watt,[24] found no evidence of cellular activity concerned in calcification of the pineal, choroid plexus, thyroid gland and arteries, and concluded that the mechanism was one of precipitation of calcium carbonate-calcium phosphate because of the local alkalosis resulting from lowered carbon dioxide concentrations in areas of low metabolism. Barr,[23] to our knowledge, is the first essayist to suggest inclusion of the obscure disease, calcinosis universalis and calcinosis circumscripta, in the dystrophic calcifications. Several analyses of the subcutaneous and soft tissue deposits have been found to have calcium and phosphorus in the same ratio as in bone (Fontaine, *et alii*,[6] Scholz,[25] and Moran[26]). No morphological or chemical dissimilarity with peritendinous calcareous deposits has been described. Furthermore, Scholz,[25] reviewing the literature and reporting a carefully studied case found it anatomically characterized by inflammatory changes in the interstitial connective tissue of muscles and subcutaneous regions with secondary calcium deposits confined to the fibrous elements.

> "The calcification process is confined strictly to the fibrous tissue, and here, only those fibers which have undergone a certain amount of degeneration. Muscle fibers, no matter how degenerated they may be, contain no calcium salts."

He observed that it seemed to be pathologic fibrous tissue alone which took on calcium salts in any kind of pathologic calcification except the metastatic form. Furthermore, he thought calcinosis probably should not be classified as a separate pathologic entity but as an advanced stage of a chronic inflammatory condition which may be the basic lesion common to all members of the scleroderma group.

The similarities between this widespread disease of calcareous deposition of unknown etiology and the small usually single chemically similar depositions of peritendinitis calcarea are

striking. We have found only one report, that of Pedersen,[27] of bone formation in connective tissue in connection with a calcareous deposit in calcinosis. We do not know exactly how to interpret this since the deposit was said to lie "on the right femur" and the specimen was obtained by "boring," presumably with a trochar.

A final type of dystrophic calcification is that which occurs within dead parasites or as reactive calcification in the host tissue. Guinea worms, tape worms, hydatid cysts, flukes and Schistosomes have been described, but no true bone formation has ever been reported (Samuel[28]). However, Ross[29] reported the demonstration of phosphatase within trichina cysts in rat muscle just prior to the calcification of the capsules of the cysts.

We hope to discuss the biochemistry of the pathological processes involved in dystrophic calcification at a later date. The histopathological picture has been adequately presented by Pedersen and Key.[30] We are purposefully avoiding discussion of the treatment of peritendinitis calcarea in order to concentrate our efforts on the establishment of its confines as a disease entity.

SUMMARY AND CONCLUSIONS

(1) The literature on peritendinitis calcarea has been reviewed.

(2) Three new locales of calcareous deposition are reported:

(a) Quadratus femoris tendon
(b) Radiocarpal ligament
(c) Ulnar collateral ligament

(3) An attempt has been made to delineate the disease entity and to differentiate it from ossification in various structures about joints.

(4) A relationship between dystrophic calcification and calcinosis is proposed.

(5) Considerable question is expressed as to the validity of the theories of Leriche and Policard regarding the role of amorphous calcium deposits in heterotopic ossification.

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DISCUSSION (*Abstract*)

Dr. Herbert E. Hipps, Waco, Tex.—There are two things of importance that we should have learned from this paper.

One of them is that this disease condition, which we have commonly thought existed only in the shoulder, is found in many other locations in the body. It is entirely possible that many of us have missed the diagnosis in vague, obscure joint pains, because we overlooked this possibility. These small, calcareous masses easily could be missed, because they would be hidden by an adjacent bone and the condition thus would not be recognized. We must, therefore, keep this condition in mind in considering the diagnosis of any joint pain.

The second thing of importance that the authors have brought out, is that this is a distinct, definite, clinical entity. They have differentiated it from the other types of pathological calcifications and ossifications.

INTRAMEDULLARY FIXATION FOR FRACTURES OF THE SHAFT OF THE TIBIA*

By J. Otto Lottes, M.D.
St. Louis, Missouri

When Kuntscher first introduced his long heavy nail, he used it for fixation of suitable fractures of the shaft for most of the long bones. Other European surgeons[3 4 5] adopted this method, one of the most enthusiastic being Boehler.[1] However, after several years Boehler and Boehler[2] reported that they had abandoned its use for fractures of the tibia. They concluded that the usual methods gave better results for tibial fractures.

When one studies the shape of the medullary canal of the tibia he can readily see why they gave up tibial nailing since they were depending entirely upon the nail for fixation. The canal of the tibia being extremely wide at either end and very narrow in the distal portion of the mid one-third, no pin or combination of pins would give adequate fixation alone. Therefore, supplementary fixation is required.

This report covers the experience gained from 101 consecutive tibial nailings done mostly at the City Hospital and Homer G. Phillips Hospital of St. Louis.

In this series of cases when the nail was first used it was found that rotation was not prevented by the nail alone. Therefore, long leg plaster casts were applied and in so doing the nail was used in the same manner as other forms of internal fixation for fractures of the tibia. This occurred long before Boehler and Boehler reported their abandonment of the tibial nail.

The nail used is a 3-flange nail and is made of 18-8 SMO stainless steel. It is three-eighths inches in diameter, has a curve on each end with one flange on the concave side and two flanges on the convex side (*Fig. 1-C*). This was so designed to lessen the chance of the nail's cutting out through the posterior cortex during insertion. It is not made too rigid, since the nail should straighten out to some extent while it is being inserted. Also in some cases a recurvatum may occur during nailing and this can easily be corrected *in situ* by manipulation at the time of nailing or when the cast is changed about 10 days later. There is a pointed tip on one end with a threaded tip on the other to which the driver attaches.

The instruments needed are few in number and the only special ones required are the driver and extractor which are the same as those for the 3-flange femoral nail.[6] *Fig. 1* shows all the instruments needed, not counting the usual soft tissue set.

Advantages of the Nail.—(1) Insertion is relatively easy. The average operating time is less than 30 minutes, including the time required to take and develop one set of x-ray films.

(2) Nailing can be done by the operator and a nurse assistant.

(3) The nail is easily inserted by the closed method since the tibia is practically superficial in its entire length and reduction can be accomplished by the closed method. This has the advantage of having the operative site a distance from the fracture site, thereby eliminating the complications that can occur when an open reduction is done. Since the skin and adjacent soft tissues at the fracture site are usually extremely tense, the difficulties encountered in closing incisions in these tissues are eliminated. Also there is no increase in stripping of the periosteum at the fracture site, which is important in comminuted fractures.

(4) In transverse or slightly oblique fractures, walking in plaster is permitted in about two weeks at which time the swelling has subsided

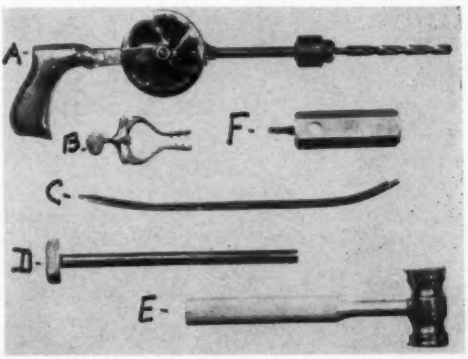

Fig. 1

Instruments: (A) Hand drill with three-eighths-inch drill point; (B) mastoid retractor; (C) tibial nail; (D) driver; (E) mallet; and (F) extractor.

*Read in Section on Orthopedic and Traumatic Surgery, Southern Medical Association, Forty-Fifth Annual Meeting, Dallas, Texas, November 5-8, 1951.

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and a new cast with a walker is applied. This is a very decided advantage in elderly people who handle themselves very poorly with crutches, or others with fractures of another extremity in which crutches cannot be used. With early weight bearing one can expect earlier union than with non-weight bearing.

Fractures Suitable for Nailing.—(1) Any fracture of the middle one-third or upper portion of the lower one-third of the shaft. This would include oblique and comminuted fractures, with transverse being the most suitable.

(2) Multiple segmental fractures, that is, double or triple with short middle segments.

(3) It can be used in fractures of the upper one-third; however, reduction is not so complete as in the other locations due to the width of the canal.

The procedure as developed appears to be relatively easy after one is able to overcome two or three difficulties which occur when the first few nailings are done. These are:

(1) The cutting of a slanting hole of sufficient size (three-eighths inch) through the anterior cortex of the tibia to permit the nail to be inserted at a very acute angle.

(2) Starting the nail with the tip aimed at the crest of the tibia at the junction of the middle and lower one-third and with the flange on the concave side in the same plane as the tibial crest in this region. This permits easy passage of the nail through the narrowest portion of the medullary canal.

(3) Depressing the mid portion of the nail against the knee with the palm of the hand, after the nail has been inserted in the previously drilled hole. This tends to prevent the nail from cutting out through the posterior cortex when the tip strikes this region.

Length of the Nail.—This is obtained by measuring directly the distance from the medial malleolus to the mid portion of the tibial tubercle on the good leg. When the nail is inserted at the level of the mid portion of the tibial tubercle the threaded portion will protrude from the cortex and the tip of the nail will be about one-fourth inch from the ankle joint. In fractures of the mid portion of the shaft a shorter nail can be used with safety.

Width of the Canal.—The narrowest portion of the medullary canal is in the lower portion of the middle one-third. However, it was found that with the three-eighths inch nail no difficulty was encountered during nailing of any case in this series. At times the nail appeared to be hung in the canal when it was not inserted with the anterior flange aimed at the crest of the tibia at the junction of the mid and lower one-third; however, upon reinsertion of the nail to conform to this, it was then driven down without difficulty.

Position of the Patient.—The patient is placed in the usual supine position on the fracture table and the injured leg is fastened in the foot traction apparatus. Counter traction is obtained by passing a sling under the distal femur, attached to an overhead frame. The hip is flexed to about 60 degrees and the knee to about a right angle. The sling is kept under the distal femur at a right angle to its shaft at all times. Strong traction is applied to distract the fragments to facilitate reduction. After reduction the leg is prepped from the traction apparatus at the ankle to the counter traction at the knee and is draped so that it is exposed from the ankle to the knee (*Fig. 2-A*).

Insertion of the Nail.—A 1½-inch longitudinal incision is made about one finger's breadth medial to the tibial tubercle at its mid portion (*Fig. 2-A*). The incision is carried down to the bone. However, the proximal one-half inch is made only through the skin and subcutaneous tissue. This prevents damage to the skin during insertion of the nail.

The periosteum is elevated and a three-eighths inch hole is drilled obliquely through the outer medial cortex at a very acute angle just opposite the mid portion of the tibial tubercle, the drill being started at a right angle to the long axis of the shaft, and when the tip of the drill enters the medullary canal the drill is turned slowly and at the same time its handle is depressed into the groove between the patella and the femoral condyle to the extent that the drill itself depresses the skin. The tip of the drill is aimed at the crest of the tibia at the junction of the mid and lower one-third. While the hole is being drilled the skin above the incision must be protected. This can be done by using a thin flexible piece of metal.

The tip of the nail is inserted into the drill hole, the convex surface of the nail resting on the cortex of the tibia so that the flange on the concave side faces outward. The tip of the anterior flange is aimed at the crest of the

tibia at the junction of the mid and lower one-third of the shaft. A thin flat piece of metal is placed between the skin and the nail to prevent damage to the soft tissues while the nail is being driven down the canal. The nail is depressed so that it is nearly parallel to the long axis of the tibia. It is driven down the canal and when the tip strikes the posterior cortex a resistance will be felt. At this point it may be advisable to cut a tract with an osteotome for the anterior flange so that the nail can be depressed a little farther. In depressing the nail use the palm of the hand directly against the mid portion of the nail (*Fig. 2-B*). After this the nail usually passes down easily.

The progress of the nail can be checked by using a nail of the same length for measuring on the outside of the tibia. When the nail has reached the fracture site, reduction and rotation are checked by palpation of the anterior crest of the tibia. The nail is driven past the fracture site into the distal fragment. Usually after the nail has penetrated the distal fragment for several inches fixation appears to be good. If in doubt

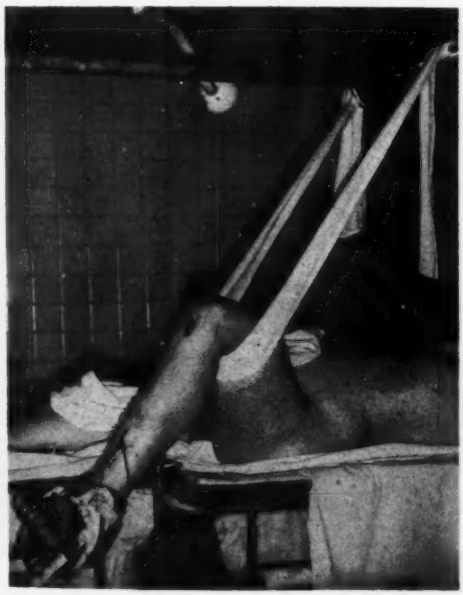


FIG. 2-A

Position of the Patient. Note flexion of knee and overhead traction. A compound fracture nailed upon admission. The tibial tubercle and the line of incision have been painted on the leg to show their relationship.

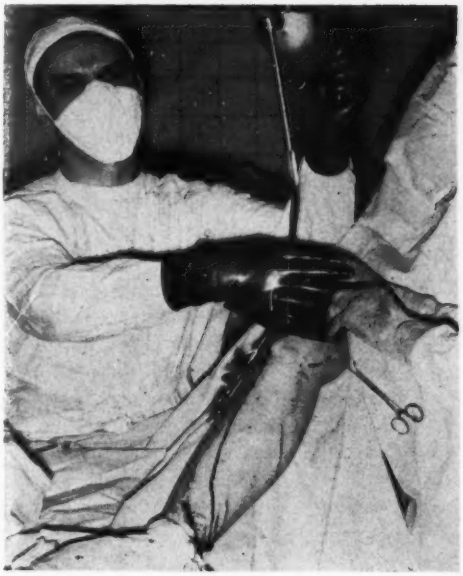


FIG. 2-B

Illustrates the method for depressing the nail when it is first being inserted to prevent the tip from penetrating the posterior cortex. It is important to depress the nail in its mid portion and not attempt to depress it with the driver as the latter puts a reverse bend in the nail.

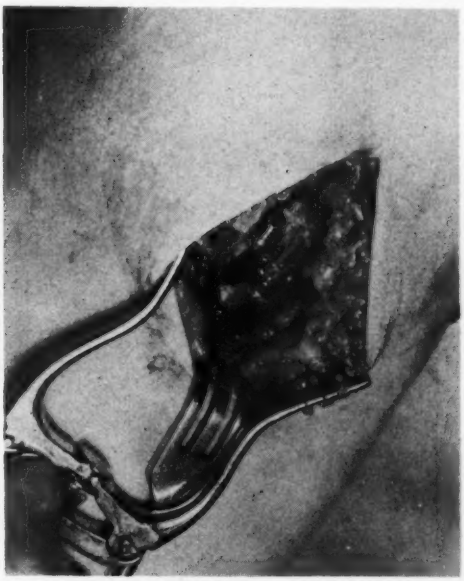


FIG. 2-C

Shows the incision and only the threaded portion of the nail protruding from the cortex after the nail has been driven home.

an x-ray can be taken. The nail is driven down until about one inch remains protruding at its insertion. Then an anterior-posterior and lateral x-ray are made of the ankle joint to determine the distance from the tip of the nail to the ankle joint. If there is sufficient room, the nail is driven down until the driver strikes the outer cortex thereby leaving only the threaded portion of the nail protruding. This will permit extraction when the fracture has healed (*Fig. 2-C*).

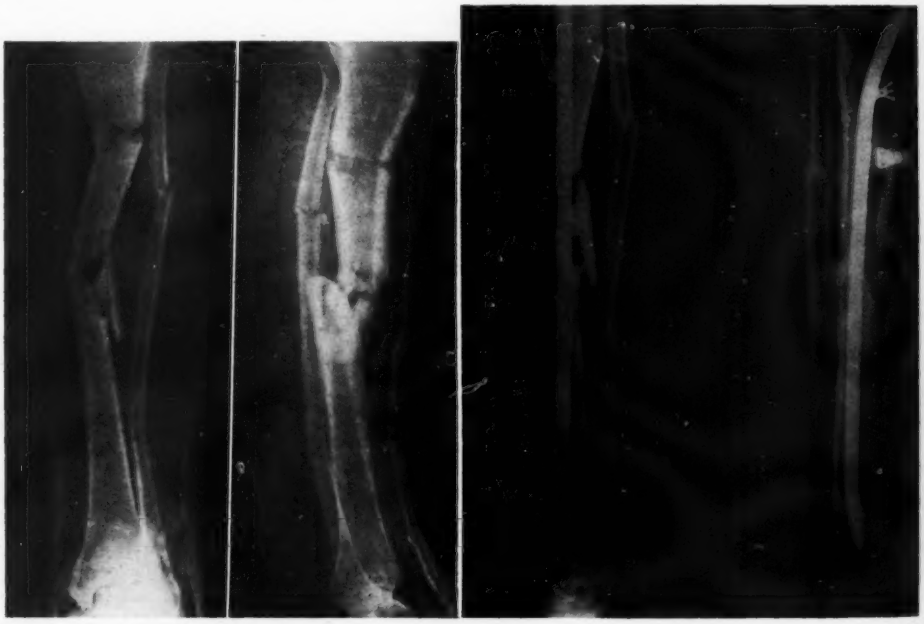
If the nail is too short, especially in fractures of the lower one-third, an extension can be attached and it can then be driven down the correct length. The distance of the nail from the ankle joint can be checked by using a nail of the same length and laying it alongside the tibia. In that way one gets an idea of the penetration of the inserted nail. After the nail has been driven home, the wound is closed in layers and a plaster cast is applied from the groin to the toes.

Aftercare.—After observing the usual precautions regarding swelling, and so on, the patient is gotten out of bed on crutches but with no weight bearing. Immediate active elevation of the leg is encouraged along with exercise of the toes. At the end of 10 to 14 days the cast is removed, sutures are removed, and on the transverse or mildly oblique fractures a walking cast is applied from groin to toes. Following this the patient is on full weight bearing in the cast until the fracture is healed. In the comminuted, especially the butterfly type, full weight bearing in the cast is not permitted until enough union has occurred to prevent telescoping of the fragments.

COMMENTS

In a few cases no casts or short leg casts were applied and in these cases union was slower than in the ones with a full length cast.

In patients who had considerable swelling at the fracture site, especially the obese, difficulty was at times encountered in accurate palpation of reduction at the time of the original trauma. Therefore, if one waits about one week before nailing, the swelling usually subsides if the limb has been kept elevated and then reduction can easily be determined by palpation.



A B

FIG. 3

A 54-year-old man with a compound segmental fracture of the tibia. Nailed by the closed method after primary healing of the compound site, ten days after debridement and closure of the wound. The patient began full weight bearing in the cast three weeks after nailing. Cast removed five months after nailing, then full weight bearing without support. (A) Pre-nailing film; (B) Six months after nailing.

When distraction occurs during nailing it will usually close on weight bearing in the cast.

This nail has been used in 101 cases for fractures of the upper, mid and lower one-third of the shaft of the tibia, including 21 double and one triple segmental fracture (*Table 1*). In this group of nailings, two were for non-union, seven for delayed union, and there were 92 fresh fractures including 37 compound fractures. Nineteen of the compound fractures were nailed on admission with the others 10 to 14 days later. All compound fractures were irrigated, debrided, and closed upon admission. The ages of the patients ranged from 14 to 84 with 78 per cent of the patients over 35 and 48 per cent over 50 years of age.

There were six cases of bilateral nailings, and three cases which had fractures of the femur as well as tibia with both being nailed. Two cases were on the opposite side and one on the same side. Bilateral tibial fractures and the cases of femoral and tibial fractures on the same side were nailed as one operation.

FIG. 4-A

Pre-nailing film of a 66-year-old man with a compound triple segmental fracture involving all three portions of the shaft of the tibia. Nailed by the closed method on admission after debridement. The patient began full weight bearing in a walking cast two months after nailing. With removal of the cast six months after nailing, he began full weight bearing without support. (See *Figs. 4-B* and *4-C*).

END RESULTS

Of the 89 consecutive tibias nailed prior to July, 1951, there were three deaths (four tibias) and no followup on four. The remaining 81 all developed union. However, one required 24 months while two required 16 months.

Union was considered to be present when the leg had been out of plaster or other support, on full weight bearing without support of any kind, no pain at the fracture site on full weight bearing, no pain on direct pressure over the callus at the fracture site, no pain on torsion or springing of the bone at the fracture site, and the x-ray showed that callus had bridged the defect. However, in some the fracture line was still visible. *Table 2* shows the number of months required for solid union and the number of cases for each.

FIG. 4-B

Same patient as *Fig. 4-A*, seven months after nailing and one month after full weight bearing without support.

Deaths.—In this series three deaths (3 per cent) occurred after nailing, one in four days from a lower nephron syndrome following a transfusion of mismatched blood. The other two occurred two and three months after nailing respectively, one during an epileptic convulsion and the other from cardiac failure.

Infections.—Three cases became infected (3 per cent), two at the fracture site. Both were infected compound fractures which had delayed nailing, one of which was nailed while infected through an oversight. The third case developed an infection at the nailing site in a simple fracture. In all cases adequate drainage was established and the nail left in place until union occurred. All three cases have united. However, the two with the infection at the fracture site required 16 and 24 months respectively.

Recurvatum.—This occurred in several cases and when it was noted during insertion it was corrected by bending the nail *in situ*. If it was not noted during insertion of the nail and was found present when recheck films were made about two weeks later it was corrected at that time by manipulation *in situ* without an anesthetic when the cast was changed. This did produce some fleeting pain but it was done with a quick thrust and the patients did not object to any extent.

In a few other cases the patients did not return for their followup and the recurvatum was not noted until several months had elapsed. These cases were left alone and no difficulty was noted from either a functional or cosmetic standpoint after union had occurred.

Shortening.—This occurred in a few cases due to telescoping at the fracture site in the badly comminuted fractures.

Fracture After Removal of the Nail.—This occurred in two patients who had been on full weight bearing at least three months after removal of the nails. Both patients sustained injuries similar to the original trauma and sustained fractures through the old fracture site. One was nailed again without difficulty but

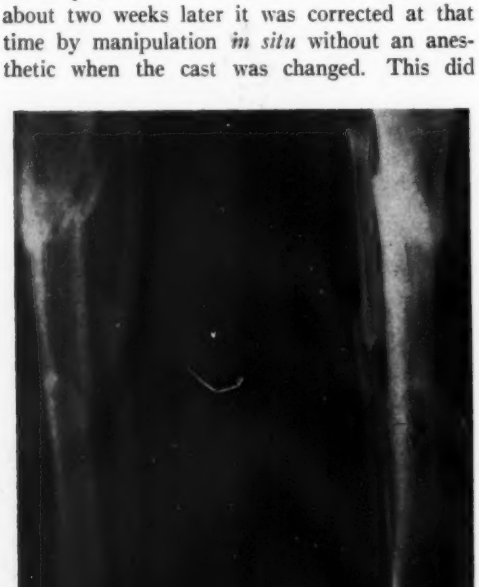


FIG. 4-C

Same patient as *Figs. 4-A* and *4-B*, after removal of the nail, eleven months after nailing.

FRACTURE SITE			
Proximal One-Third			
Transverse			3
Oblique			5
Comminuted			8
			16
Middle One-Third			
Transverse	12		
Oblique	26		
Comminuted	53	(28 butterfly fragments)	
	91		
Lower One-Third			
Transverse			4
Oblique			9
Comminuted			4
			17

(Fractures at the junction of the upper and mid one-third and those of the mid and lower one-third were classified as mid one-third fractures in the table).

This makes a total of 124 fractures, 19 of which were transverse, 40 oblique, and 65 comminuted, including 28 with butterfly fragments.

TABLE 1

Months	Number of Cases	
3	1	
4	21	
5	26	
6	9	
7	7	(Two cases had no followup between first and eighth month)
8	7	
9	3	
10	1	
11	2	
12	1	
16	2	
24	1	
Total	81	

TABLE 2

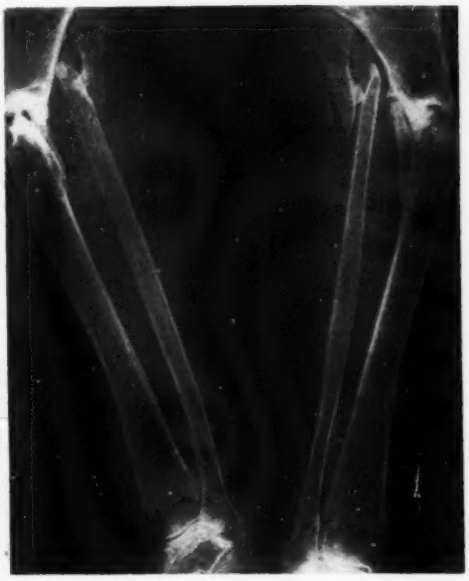


FIG. 5-A

Pre-nailing film of a 67-year-old man with a non-union of the upper one-third of the shaft of the tibia of ten years' duration. An open nailing was done with removal of the sclerosed portion of the bone and the placing of iliac bone grafts around the fracture site. The patient began full weight bearing in a walking cast the day following the nailing. The cast was removed six months after nailing, then he began full weight bearing with a cane. (See *Figs. 5-B* and *5-C*).

FIG. 5-B

Same patient as *Fig. 5-A*, nineteen months after nailing just prior to removal of the nail.

expired a few months later during an epileptic seizure. This was one of the deaths mentioned above. The other case was treated by closed reduction and not nailed. He subsequently developed a non-union requiring a bone graft.

Displacement of a linear fracture during insertion of the nail occurred in one case.

SUMMARY

(1) A total of 101 cases have been nailed, using a new type of nail, 3-flange, for fractures of the shaft of the tibia.

(2) There were 16 fractures of the upper one-third, 92 of the middle one-third, and 17 of the lower one-third, making a total of 124 fractures, 19 of which were transverse, 40 oblique, and 65 comminuted including 28 with a butterfly fragment.

(3) There were 21 double and one triple segmental fractures. Two were cases of non-union, seven delayed union, and 92 fresh fractures including 37 compound fractures, 19 of which were nailed upon admission with the others 10 to 14 days later.

(4) Infection occurred in 3 per cent of the cases.

(5) Of the 89 consecutive tibias nailed prior to July, 1951, 81 were followed and all developed union.

FIG. 5-C

Same patient as *Figs. 5-A* and *5-C* after removal of the nail.

(6) The indications and advantages of the nail were stated, as well as the technic for insertion and aftercare.

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16 Hampton Village Plaza

DISCUSSION (*Abstract*)

Dr. Robert A. Knight, Memphis, Tenn.—Dr. Lottes has presented a method of intramedullary fixation of the tibia which appeals to me; I intend to try it. My earlier experiences with the Kuntscher nail for fractures of the tibia were disappointing. Just as in the forearm, there are inherent anatomical features which make satisfactory fixation difficult. The Rush pin has been used by some surgeons with success, but the three-flanged nail described by Dr. Lottes has an advantage in that it should prevent rotation more successfully than the round Rush pin. Wisely, the author emphasizes the fact that the nail will not entirely prevent rotation, and that external plaster fixation extending to the groin must be maintained until the fracture is united.

Dr. Lottes mentions that some of the advantages of the method are "relatively easy insertion of the nail with a short operating time," and that "the nailing can be done by the operator and a nurse assistant." I should like to warn, however, that there are pitfalls and difficulties and that inexperience with this type of surgery is a definite contraindication to the method.

Dr. F. Walter Carruthers, Little Rock, Ark.—The paper presented by the essayist pertains to fractures in long bones which have been generally neglected in the literature because of the great emphasis placed on intramedullary treatment of fractures of the femur and to a less extent, the humerus.

Frankly, with few exceptions (two, to be exact), we have been disappointed in using this type of fixation in the tibia. Until he devised the one shown we felt the usual type of intramedullary fixation such as Kuntscher, Hansen-Street and Rush nails were not fitted for fractures of this bone. We have been content to use the established method and glad that Dr. Lottes offered this refinement. No one could offer more convincing results. It would appear from his cases, and our limited experience, that this method will be especially useful in bone grafting for nonunion. Many times we have wished for such a fixation device to augment the use of bone graft in the diaphysis of the tibia. The number of cases and satisfactory results argue that his nail is one answer in treatment of tibial problems.

Dr. Dana M. Street, Memphis, Tenn.—Dr. Lottes is to be congratulated upon having few infections in the tibia where the bone is superficial and the skin frequently has been subjected to trauma. We have had very little experience in nailing the tibia, having used Rush nails in only a few cases.

Dr. Lottes (closing).—I mentioned the short operative time to help impress you with the ease with which this procedure can be accomplished, especially after one has done two or three and masters the technic of closed nailing. It is a much simpler procedure than medullary nailing of the femur since many of the difficulties encountered during nailing the femur do not occur in tibial nailing.

I mentioned that a nurse would suffice for an assistant because many of the hospitals nowadays have no interns and one has to depend upon whomever is available. All that the assistant is required to do is drive the nail past the fracture site with several blows on the driver while the surgeon maintains reduction. Up to this point and after this, the surgeon can do the job alone.

As in all operative procedures, a certain number of pitfalls and difficulties may be encountered by the inexperienced.

Concerning omission of casts, we did try several cases with short leg casts, only four in number, and they were definitely a longer time in healing than the cases in which a long leg plaster was used. We believe that rotation was not prevented by the short leg cast and nail and that this may have accounted for the longer healing time. We have also had several cases in the hospital which have had other fractures or injuries which necessitated the patient's remaining in bed for treatment and they were allowed to go without any external fixation. In these cases also, the healing was delayed and it was believed that the greatest benefit of this procedure is that patients can and do go on full weight bearing in the cast in a relatively short time. This results in an ideal situation for the healing of a fracture, that is, constant compression and normal or partially normal physiologic function of the soft tissues around the fracture.

I should like to stress the following points. The three-eighths inch hole should be drilled at a very acute angle. To do this, the drill itself must be pressed down on the skin between the medial femoral condyle and the patella, while protecting the skin with a piece of metal. Another important point is to start the nail down, with the flange on the concave side, aiming toward the crest. If the nail is turned so that the flange on the concave side is not facing the crest, the nail will become impinged when it reaches the narrow part of the tibia at the junction of the middle and lower thirds, since a triangular-shaped nail is crosswise in a triangular-shaped cavity. In several of our earlier cases, in which the nail started down with the flange more medial, we noticed that the nail tended to stick at this point but if we retracted it and derotated it so that this flange was on the crest of the tibia, it would drive down with ease. In other cases we noticed that the nail itself rotated into this plane.*

*The nails are manufactured by the Charles A. Schmidt Instrument Company, 3689 Olive Street, St. Louis, Missouri.

A RELATIVELY SIMPLE METHOD OF BRONCHOGRAPHY FOR THE RADIOLOGIST*

By J. A. MEADOWS, JR., M.D.
Birmingham, Alabama

Radiologists are all acquainted with the common handicaps to successful bronchography and realize that some simple method for the proper injection of a radiopaque material and obtaining homogeneous distribution throughout the bronchial system is desirable. It is my impression that bronchograms are ordered more frequently by thoracic surgeons than in the past, and with a greater demand for accuracy. We must not forget about the comfort and dangers to the patient; they too are of prime importance in any procedure. It is for these reasons and the need for greater supervision by the radiologists that I should like to present to you this method of bronchography.

My first acquaintance with this procedure came in February, 1946, when I had the good fortune to observe its use by Dr. Herbert W. Schmidt[1] of the division of medicine of the Mayo Clinic. During the next twenty-one months which I spent in the Navy I had the opportunity to do bronchograms by this method in over three hundred cases, and have continued to use it during the past two years in our private practice. I have deviated some from the original procedure as I have found it necessary to do so by the demands of private practice and the arrangements peculiar to my own situation.

Many methods for the installation of an opaque oil into the bronchial tree have grown in popularity and have been, or should be, set aside. Puncturing of the cricothyroid membrane with a needle and injecting the oil in this manner gives excellent results, but has generally been condemned because of the primary discomfort and the associated complications which have arisen. There are many and varied supraglottic methods, but they too have their failings. Frequently the patient swallows a large quantity of the opaque material or it fails to reach the proper location within the lung itself. The cannula, catheter and bronchoscope have all been used as direct methods of installation of lipiodol® or iodochloral.®[1,3] I should like to limit my discussion today to a method of tracheal catheterization.

The preparation of our adult patients is as follows: (1) They are requested to take nothing by mouth for six hours before the examination. (2) They are to perform postural drainage for fifteen to twenty minutes prior to coming for the examination. Postural drainage is carried out by having the patient lie across the bed with his or her shoulders in a bedside chair so that the shoulders are below the level of the waistline, and then the patient is requested to cough in an effort to raise any material which may be plugging the bronchi. (3) When the patients arrive at the office they are given atropine sulfate grains 1/150th and nembutal® grains 1½. A twenty- to thirty-minute delay is allowed for the drugs to take effect. (4) The patient is brought in and the posterior portion of the oral pharynx is sprayed with 2 per cent pontocaine® hydrochloride. The spray procedure is repeated after a five- to ten-minute delay. During the spraying the patient is requested to inhale, in an effort to coat the larynx and trachea. He is cautioned not to swallow any of the excess material. Ten to fifteen minutes are allowed for the local anesthetic to take effect, after which time a 12, 14 or 16 French catheter may be passed through the nasopharynx into the trachea. (5) The patient is asked which side of his nose is most patent, and as a rule he will be able to tell. The tip of the nose is then compressed and the catheter is slipped into the preferred side. It is inserted to such a depth that the tip of the catheter may be seen through the oral pharynx and just below the level of the uvula when the tongue is retracted out of the mouth. The patient is requested to flex the chin upon the chest and to take a deep breath. At the height of the inspiration the catheter is given a sudden shove in an effort to send it in between the cords into the larynx. There is usually an exacerbation of coughing when the tube reaches the trachea and the patient can no longer say "e" clearly. These two signs are our surest means other than fluoroscopy of telling that the tube is in the trachea and not the esophagus. Should the first attempt fail it is repeated again until successful. On each further attempt raise the chin to a slightly higher level. In some patients it is easier to insert the catheter with the head flexed and in others with the head extended. If difficulty is encountered in inserting the catheter it may be that it is displaced laterally by a deviated septum or posteriorly by having the neck too acutely flexed. The former may be remedied by placing the catheter in the opposite nares or by

*Read in Section on Radiology, Southern Medical Association, Forty-Fifth Annual Meeting, Dallas, Texas, November 5-8, 1951.

inserting the catheter through the oral pharynx. If the oral method is used the catheter is guided by means of a plain wire stylet which is bent to accommodate to the particular patient being examined. A second method of oral insertion is by means of a reflecting mirror, using laryngeal forceps to place the tip of the catheter between the cords. If we insert the catheter, 3 to 5 cc. of 2 per cent pontocaine® are injected through it into the trachea while the patient takes a deep breath. All coughing will usually stop. A word of caution: if the patient should continue to cough it is best to delay the injection of the oil until the coughing is under control.

We have on occasion made use of our ear, nose and throat associates who have consented to help if we ran into difficulty. I have found it necessary to use their help in less than five per cent of cases. Bronchography frequently follows bronchoscopy, and is a simple procedure to carry out if the bronchoscopist inserts the tube into the trachea proximal to the carina at the completion of his examination. The patient is then brought to the x-ray department and put through the necessary manipulations for the injection of the oil.

Fig. 1 shows the small amount of equipment necessary to carry out this procedure. Included are a head mirror and tonsillar tenaculum. The head mirror and tenaculum are instruments which you will find little need for as you become more adept at inserting the catheter through the nose. Forty per cent lipiodol® comes in two sizes, either a 20 cc. bottle or two 10 cc. ampules. Sponges are necessary as are tongue blades. There are two sizes of catheters shown here, the 12 and 14 French. The 16 French may also be used. The 30 cc. syringe with a metal adaptor is by far the most convenient for injecting the lipiodol® into the catheter as it fits snugly and is easy to maintain in position. A smaller syringe is used for the injection of the pontocaine® into the catheter after it has been inserted into the trachea. The atomizer is self-explanatory as is the pontocaine® hydrochloride 2 per cent.

In *Fig. 2* one can see the patient in position for the injection of iodized oil into the right lung.[2] She is tilted to the right on her hand which allows the oil to descend into the right middle and lower lobes. The iodized oil is used at room temperature and is injected at a moderate rate. It may be injected rapidly if the patient is well anesthetized and accommodated to the procedure. The tube should be pulled out of the nose a distance equivalent to the length of one's hand before the injection of the oil is started in order to be sure that the tip of the tube is proximal to the carina. A total of 20 cc. of 40 per cent lipiodol® is injected. When the injection has been completed the patient is turned down on her right side perpendicular to the table (*Fig. 3*), and the table is tilted at forty-five to fifty degrees. The patient is kept in this position for one minute. The table is brought back to the horizontal and the patient is rolled forward forty-five degrees and then returned to the fifty degree angle for a second one-minute interval as is shown in *Fig. 4*. Following this procedure a right posterior oblique and a posterior-anterior Bucky film of the chest are taken. A film may also be exposed in the lateral position if one so desires. The patient is then brought back to the table and a similar procedure is carried out for filling the left side. However, on this side the patient is requested to lean down on her elbow in order that a portion of the oil may reach the lingula as well as the left lower lobe (*Fig. 5*). This is followed by taking films in the left posterior oblique position and a second posterior-anterior film. The latter may be taken stereoscopically, particularly if a tumor is suspected. We feel that it is always wisest to examine both lungs, using 20 cc. in each side, where bronchiectasis is suspected. It is customary to remove the catheter after the injection of the second 20 cc. of iodized oil. It may be left in, however, until the films have been checked in order to be certain that all segments of the lung are accurately demonstrated.

If the procedure is carried out on children it is advisable to do it under a general anesthetic in the hospital and to inject a quantiy consistent with the size of the patient examined. It has been advised by some authors[3] that one lung be examined at a time with aspiration following each injection and set of films. We have found this a worthwhile precaution as cyanosis is quick to occur even after the injection of only one side.

The exposures which I have recommended above may be taken either with the upright or table top Potter-Bucky diaphragm at a distance of four or six feet as either type of film is adequate. The amount of distortion is of no consequence. The Bucky films give better detail in heavy individuals. In the thin patient or those of moderate obesity a plain upright cassette changer can be used simply by increas-

ing the kilovoltage over the estimated for an ordinary chest ray by ten for posterior-anterior films and fifteen for the oblique.

I should like to show two cases which demonstrate quite clearly what can be done with this method:

Case 1.—A 66-year-old white man who had had a previous diagnosis of a minimal pulmonary tuberculosis involving the left apex. He had episodes of hemoptysis but a cough which was otherwise not productive. No positive sputums could be obtained and a bronchogram was requested. *Fig. 6* reveals a minimal pulmonary in-

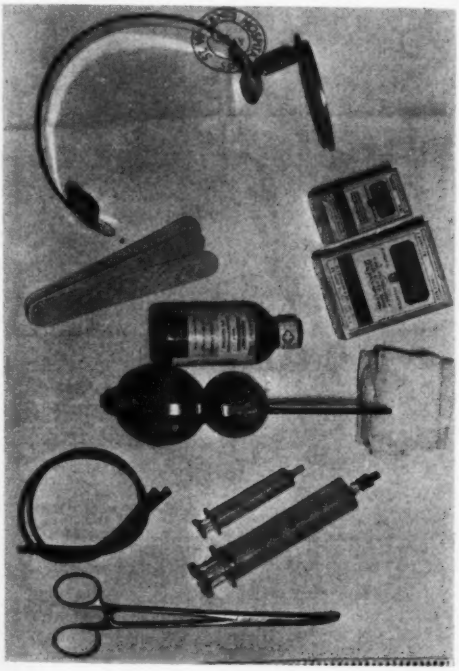

FIG. 1

FIG. 2

FIG. 3

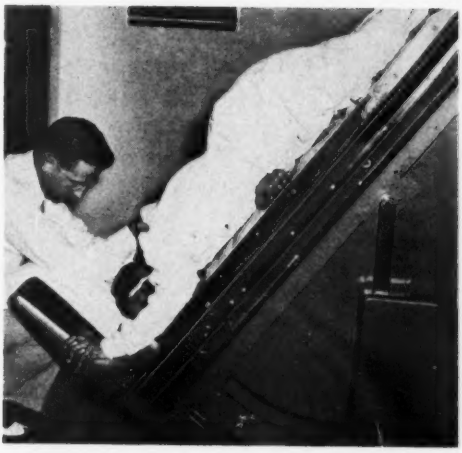

FIG. 4

FIG. 5

filtration in the left apex. *Fig. 7* is a posterior-anterior of the right chest after the injection of 20 cc. of iodized oil as described above. The lung is well demonstrated from apex to base. *Fig. 8* is a right posterior oblique which projects all of the bronchi in profile and accurately demonstrates the entire right bronchial tree. This side was negative. *Fig. 9* is a posterior-anterior view after the injection of the second 20 cc. of iodized oil. The left side of the lung is now demonstrated. Cylindrical bronchiectasis can be seen involving the apical portion of the left upper lobe. *Fig. 10* is a left posterior oblique and demonstrates very clearly, even more so than the posterior-anterior film, the presence of a cylindrical bronchiectasis involving the left upper lobe.

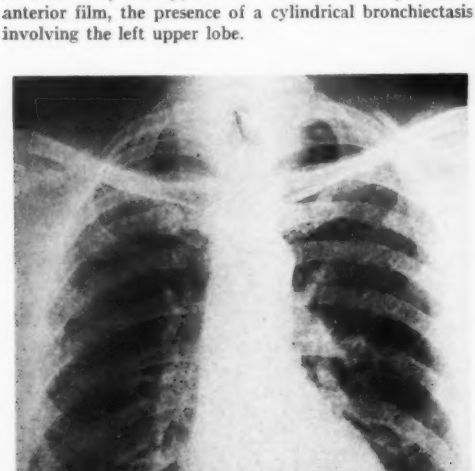

FIG. 6

Case 2.—A 17-year-old white man who had been diagnosed by his local physician as having tuberculosis with infiltration in the left base. This patient had copious amounts of thick yellow sputum on arising in the mornings. He had lost thirty pounds in weight, had hemoptysis and frequent colds. His sputums were negative for tubercle bacilli. *Fig. 11* reveals a faint shadow of parenchymal infiltration in the left base behind the heart. *Fig. 12* is a posterior-anterior film after injection of the left side. One can see cylindrical bronchiectasis in the same area as the infiltration which was seen on the

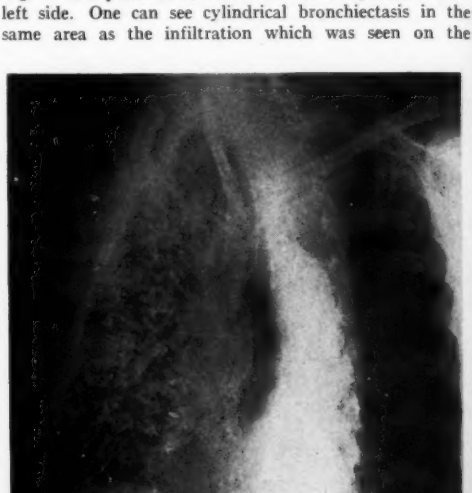

FIG. 8

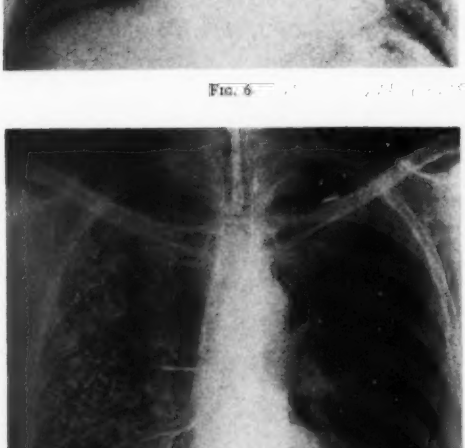

FIG. 7

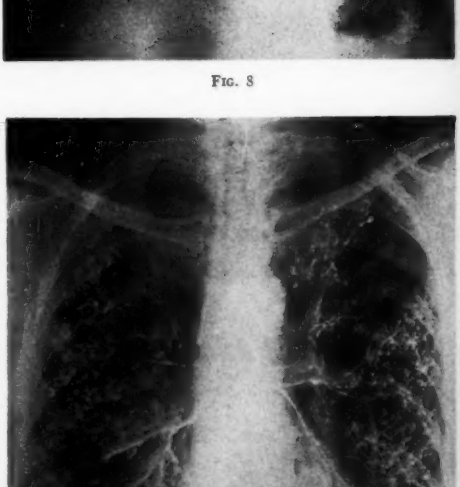

FIG. 9

posterior-anterior film. *Fig. 13* is a left posterior oblique which shows cylindrical bronchiectasis involving the dorsal ramus of the left lower lobe bronchus. The right lung was also filled but failed to demonstrate any evidence of pulmonary disease.

In conclusion I should like to say that I know this is a method which can be carried out adequately by the radiologist. If he does not see fit to insert the catheter at least he can supervise the injection of the oil. No fluoroscopy is necessary, only the use of the fluoroscopic table in tilting the patient. We have found this procedure relatively agreeable to the patient and very pleasantly accepted by the consultant. It requires minimal preparations of postural drainage and nembutal® and atropine. The insertion of the catheter through the nasopharynx and into the trachea is a technic which is easily learned. Manipulation of the patient for distributing the oil may be carried out very simply by means of a tilting fluoroscopic table. The films may be exposed either on a horizontal or vertical Bucky or simply using an upright cassette changer. We

FIG. 10

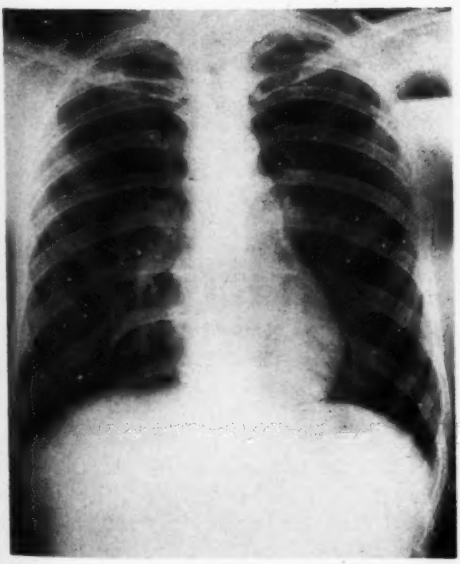

FIG. 11

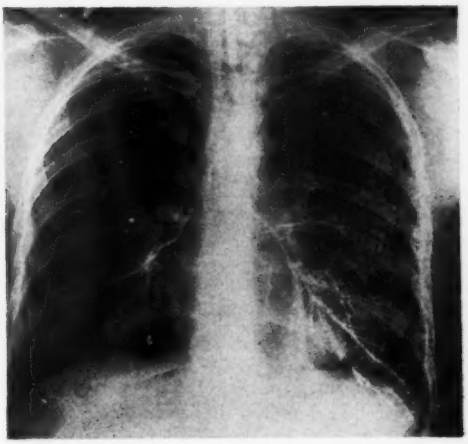

FIG. 12

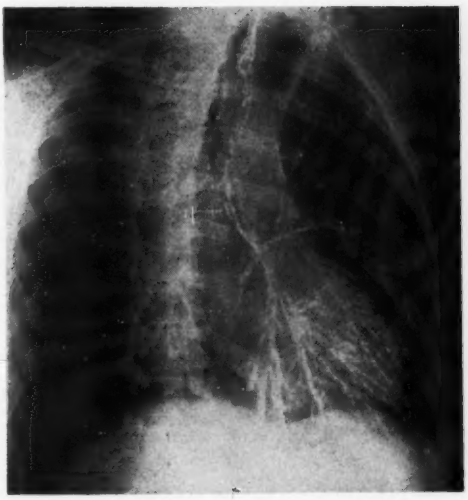

FIG. 13

have found lipiodol® to be preferable to iodochloral®. In our experience it has given a denser shadow and equally good, if not better, distribution. We have experienced only one case of drug reaction, and that was when I used 20 per cent cocaine by topical application.

I hope that I have at least stimulated your interest in an acceptable and well-tried method of bronchography and that you will give intratracheal catheterization a fair trial. I believe that you too will find that it is superior to the other methods.

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THE PROBLEM OF INDUSTRIAL DEAFNESS*

By Arthur M. Alden, M.D.
Saint Louis, Missouri

The term "industrial deafness" is a relatively new one. Otologists have recognized for many years that prolonged exposure to noises of certain pitches and great intensities would permanently damage the hearing. In 1890 Barr[1] made a survey of one hundred boilermakers who had followed their occupation for more than three years and did not find a single individual with normal hearing. In England long before the turn of the century among weavers a certain amount of deafness was looked upon as a badge of honor as indicating that the one who had acquired this disability was one of the older, more experienced workers and not a newcomer in the field. In England this condition was called "weaver's deafness" and in America the term "boilermaker's deafness" is still occasionally used to describe the hearing loss due to occupational injury. With the increased industrial production incident to the first World War interest in this condition was intensified. Since that time we have rapidly become the world's greatest industrial nation. New processes in metal fabrication have multiplied enormously and each process produces its own type of noise of its own pitch and its own intensity.

*Read in Section on Industrial Medicine and Surgery, Southern Medical Association, Forty-Fifth Annual Meeting, Dallas, Texas, November 5-8, 1951.

Certain facts are incontrovertible. Exposure to extremely loud sounds over a long period of time results in permanently impaired hearing. The louder the sound the greater is the impairment over a similar period of time. The longer the exposure to the same sound level the greater is the hearing impairment. The ears of some men are more easily and quickly injured by noise than are the ears of others.

A few questions follow naturally. "How intense does noise have to be to become dangerous? What pitch of noise is the most dangerous? How long must the exposure to such noises be to cause permanent hearing impairment?"

One question at a time. The best authorities agree that the dividing line between innocuous and hazardous noise lies somewhere between 70 and 100 decibels. In this connection Bunch[2] pointed out that the noise level of an ordinary office is about 40 decibels, that of a busy street about 65 decibels and that of a city street in heavy traffic about 80 decibels. Compare then these ordinary noises with certain industrially produced noises in order of their relative loudness.

Source	Decibel Range
Jet aircraft engine at working distance on testing block	160
Drop hammer	100-130
Rivet gun and bucker	102-128
Pin router	104-116
Circular saw	100-116
Handforming of sheet metal	100-110
Speed hammer	96-110
Trip hammer	110
Punch press	96-108
Band saw on sheet metal	106
Air drill	92-100
High-cycle milling machine	96
Public address system	90- 96
Compressed air	92
Spot weld, dimpler	82- 92
Filing	88
Hydro-press	84- 88

It is generally believed by otologists that noise of high intensity is more injurious to the hearing when it is also of high pitch than when the pitch is low. The hearing defect caused by long exposure to loud noise is initially greater for high tones than for low tones and is because of this characteristic often unrecognized by the individual until the gradual progression of this affects the frequencies in the hearing end organ that are used for speech perception. Too fre-

quently even this is disregarded for a long time, particularly if the employee has a well-paid job.

The length of exposure to hazardous noise necessary to produce permanent ear injury varies greatly in individuals. It has been found that younger persons are ordinarily more prone to ear damage by noise than are those in the middle years of life. Certain individuals cannot take noise at all and as a rule they become aware of this early and eliminate themselves from the noise hazard.

So, I think that we may define the term "industrial deafness" as a deafness that comes to a workman who is subjected to noise of an excessive intensity for a period of time and for which no other possible cause can be found.

Now, a true problem exists relative to this type of injury in industry and in industrial medicine. However, what has been done about it up until now, and what is there yet to do?

If a workman in any industry is subjected to a hazard that is inherent to the conditions under which he has to work, that hazard should be recognized, evaluated, and given proper consideration when the question of compensation for such an injury comes before the authorities legally constituted to deal with such a question. In the workman's compensation laws of only two-thirds of our states is industrial deafness recognized as a compensible injury. Indeed, in the laws of my own state (Missouri) there is no reference whatsoever to this condition.

Recently in New York state, a state that has very good compensation laws but which does not recognize industrial deafness that does not cause the employee loss of time from work as compensible, a study of a large plant making steel freight cars was done by one of our best otologists. In this plant there were some 300-500 men with demonstrable hearing losses each of whom represented a real or potential compensation claim. The noise level in this plant was from 115 to 120 decibels. Ninety per cent of the men had worked in this atmosphere of noise for from ten to twenty years. In this plant the representatives of both management and labor were acutely aware of the potentialities of the compensation problem. Management knew that if even a majority of the potential claims were awarded adequate compensation for their hearing loss, the plant would have to close. Union labor representatives knew that if this plant closed several hundred of their members would lose well paying jobs that they had held from ten to thirty years. So, they both decided to let sleeping dogs lie.

Casualty insurance carriers are also well aware of the enormity of the backlog of industrial deafness cases each with a justifiable claim for compensation. They, too, have been content to do little that would stir up the sleeping dogs.

In the meantime what has been done better to recognize or prevent this condition? For many years the American Academy of Ophthalmology and Otolaryngology, the largest society of eye and ear, nose and throat specialists in the world, has been interested in hearing conservation and has had a standing committee to deal with the prevention of deafness. Three years ago, this committee, realizing that in this great industrial nation of ours the subject of deafness due to noise had been neglected, appointed a subcommittee to deal with this problem alone. This subcommittee on "Noise in Industry" was, therefore, set up and has been at work for more than three years. The first efforts of this committee were directed toward establishing contacts with management, labor executives, and insurance carriers to the end that all available information about this problem could be assembled. None of their efforts have met with any startling success up to date, due probably to the reluctance on the part of all of them to publicize this temporarily buried dilemma. One of the first pieces of literature sent out by this committee was a statement of the most important known facts relative to noise in industry. This statement is so important that I shall read some of this just as it was sent out.

"Fact 1.—The deafness caused by loud noise is due to damage to the innermost part of the ear where the nerve of hearing ends.

"Fact 2.—Such damage is permanent; no method of repairing the delicate structures injured by loud noises is known.

"Fact 3.—Noise causes more impairment of hearing for high pitched tones than for low tones, and in the beginning most or all of the impairment is for tones above the pitch range important for the understanding of speech sounds.

"Fact 4.—The ears of some men are more easily injured by noise than are the ears of others.

"Fact 5.—In recent years apparatus has become available with which measurements of the ability to hear separate tones from the lowest to the highest, can be made quickly and accurately. (Such an apparatus is called a pure tone audiometer; many ear specialists use them).

"*Fact 6.*—In most industrial situations where injuriously loud noises exist, the volume of the noise cannot be reduced to a safe level by any method of "sound conditioning" of walls, machines, and so on.

"*Fact 7.*—Deafness due to noise can be prevented by reducing to a safe level the loudness of the sounds that actually reach the inner ear.

"*Fact 8.*—The wearing of cotton in the ears does not reduce truly injurious noises to a safe level.

"*Fact 9.*—Several kinds of ear protectors do reduce injuriously loud sounds to a level safe for the inner ear.

PRACTICAL CONCLUSION ONE

"Utilize *Facts 3, 4, 5,* and *7,* make good pre-employment hearing tests and similar tests at intervals during the first few weeks or months in surroundings with possibly injurious noises, and compare the tests. Thus, the workmen whose ears are particularly susceptible to injury by noise can be discovered before a serious degree of deafness has been caused. Once discovered, these men can be transferred to jobs in less noisy surroundings or required to use suitable ear protection. For surroundings in which most ears are not injured by the noise present, these simple procedures, routinely used, will suffice to prevent occasional cases of deafness and the resultant claims for compensation.

PRACTICAL CONCLUSION TWO

"For jobs in surroundings where it is known or suspected that most or all of the older workmen are hard of hearing due to noise, make good pre-employment hearing tests and periodic tests later and require that good ear protection be used at all times when exposed to loud noises. Thus, in case of claims, factual evidence will be available for use in determining how much damage, if any, has actually occurred to the hearing.

"The wearing of ear protectors should be made compulsory during exposure to loud noises of an injurious nature. This is as necessary for the protection of hearing as is the use of safety goggles for the protection of vision.

MANUAL OF OPERATION

"The Subcommittee on Industrial Noise has also issued a 'Manual of Operation for an Industrial Hearing Conservation Program' in which the subcommittee stresses the importance of making an adequate pre-employment hearing examination with an audiometer. The method in which it is to be made is outlined. This pre-employment audiometric record of the individual's hearing constitutes a basic record of the person's hearing capacity as he enters industry and will be of great value for future reference. The hearing examinations as now made in plants are a farce; a worker is entitled to as good an examination of his hearing function as is made of other parts of his body. The manual also indicates that should the worker be placed on a job where the noise level more or less continuously exceeds 90 decibels his hearing should be rechecked in a month or two. If his second audiogram shows a significant loss he may have a noise-susceptible ear. He should then either be transferred to a less noisy environment or, if kept on the same job, be forced to wear ear defenders of some type or other. There are ear defenders on the market which reduce the intensity of the noise as it reaches the ear by 25 to 30 decibels. With a few notable exceptions, these reduce most industrial noise to a non-injurious level."

I admit that all of this is only a beginning but it is a rational beginning and while most of the other interested parties in this problem still have their heads in the sand, the doctors at least have accepted the challenge and will do their part to meet it. However, we doctors can never solve this problem by ourselves. We can recognize this type of industrial ear injury, measure it, and sometimes give good advice as to how it may be prevented.

Management of many industries will never recognize this condition as important until forced to do so by a sizable number of damage awards against them by courts or workman's compensation commissions. Only when they realize that the potential awards in already existing cases are so great as to imperil their financial structure will they be seriously interested in preventing this type of deafness in new employees.

Insurance carriers are already aware of the seriousness of this situation but because there have been so far only a relatively few court awards made in such cases, they will wait until better compensation laws make such awards sure. Then their rates for such risks will go up and then and perhaps only then will industry realize what has been happening.

I have no solution for this dilemma, but I have a few suggestions which if followed might speed up the recognition of the potentialities of this whole problem.

Many of you here have contacts with important persons both in industry and insurance circles. I am sure that these persons will listen to you when you talk to them seriously about the progressively deafened persons who are being made deafer every day in their own plants. Tell them that the day for compensation to their employees for this injury is being only temporarily postponed and when it does come it might be financially catastrophic.

When you go home, examine the workman's compensation laws of your own state, and see if this type of industrial injury is given its proper place in the compensation tables. If it is not there, examine the laws of some other states and then see what you can do to help bring the laws of your own state up to their standard.

This is a job that really needs doing and it will only be done as the result of your initiative and your insistence.

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NEW HORIZONS IN THE RHEUMATIC FEVER PROBLEM*

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Relatively recently, many features concerning the rheumatic fever problem have been brought to our attention. However, we shall attempt to refer only to some of those which appear to be of clinical importance.

Improved Outlook.—About a decade ago the impression was gained that both the mortality and morbidity of rheumatic fever and rheumatic heart disease were decreasing. During the three years, 1938 to 1940, deaths on the pediatric service at the University of Minnesota Hospitals from rheumatic fever and rheumatic heart disease were five, nine and thirteen, respectively, whereas in 1941 to 1943 they were one, three and two, respectively. Various members of the staff remarked that the number of patients hospitalized because of rheumatic fever definitely seemed to be decreased compared with the previous decade. An increasingly large number of children was being maintained on a sulfa prophylaxis regimen and we were inclined to believe that perhaps the mortality of the disease actually was being influenced by the general use of such therapy. Improvement in the mortality was further substantiated by a study of the United States Vital Statistics. For example, deaths in the various rheumatic fever categories in the 5-14 age group for 1940, 1941 and 1943 were as follows: 1,662, 1,399 and 1,166, respectively.

In 1948, Ash[1] in a 15- to 20-year follow-up study reported there had been a decrease in both the incidence of rheumatic heart disease and the number of deaths from 1923 to 1937. During the period 1923-1927, the incidence of heart involvement either in the initial attack or when evaluated 5 or 10 years after the onset was in the neighborhood of 70 per cent. During the next two 5-year periods the incidence declined so that from 1933-1937 it was in the neighborhood of 50 per cent. The number of deaths which occurred during the initial attack or within the next 5 or 10 years showed a striking decrease in the mortality rate. These favorable trends indicated to Ash that prolonged bed rest was distinctly beneficial to patients with rheumatic fever, a finding which had been emphasized by Taussig and Goldenberg,[2] Taran[3] and others.

Further proof that the number of deaths from rheumatic fever and rheumatic heart disease is decreasing, recently was presented by Wolff[4] who made an extensive study of the death toll from rheumatic fever in childhood.

In spite of the definite improvement in the rheumatic fever problem it is perhaps both surprising and challenging that it remains a leading cause of death and disability in the school age child. In the child from 10-14 years it is responsible for more deaths than any other disease entity.[4] Our first glimpse at the horizon then, indicates a somewhat paradoxical situation, namely a picture of grandeur calling forth a feeling of pride and accomplishment in the decrease in the number of deaths and crippling from rheumatic heart involvement; yet the disorder remains a problem of major magnitude.

If one is asked to attempt to explain the improved outlook in rheumatic fever, one may readily admit that in part it is due to an improved and widespread understanding of the nature of the manifestations of the active disease. The physician deserves credit but we must also give recognition to the role of the parents for their enhanced interest and alertness. They, too, have responded to the public health educational efforts by acquainting themselves with signs and symptoms which prompt them to bring the child to the physician early.

Though perhaps not strictly pertinent to our discussion, it may be of some interest to us in the Southern Medical Association that the first person to describe the strange association of "rheumatik" pain and organic heart disease was made by a native of Charleston, South Carolina.[5] William Charles Wells, born in 1757, published an account of a boy 18 years of age and a girl

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15 years, who had acute rheumatism and cardiac complications. The girl who had rheumatism and suffered "violent beating of the heart" also had "tumors along the tendons," that is, rheumatic nodules. In Charleston, Wells is remembered as an assistant to the community's leading physician, Dr. Alexander Garden, whose name is known to us today because of his botanical interests and the development of the flower, "gardenia." The importance of the typical combination of arthritis and carditis which has become thoroughly familiar to all physicians was slow to be recognized. With the risk of drawing out our discussion, it perhaps is justifiable to review the varied and bizarre manifestations of rheumatic fever in order to touch upon some of the changing concepts.

MANIFESTATIONS

Pain.—One of the most important symptoms, pain, usually is situated in the region of the joint and oftentimes is associated with swelling, tenderness and redness, although it also may be present in muscles, the abdomen or the chest. In an attempt to obtain some idea of the relative frequency of arthritis or arthalgia due to various causes, my colleague, Dr. Howard L. LeBus, reviewed the records of 82 children with arthritis, who were admitted to the Children's Hospital of the University of Texas Medical Branch from 1947-1950. Half of these children had rheumatic fever. The other causes were: rheumatoid, 23 per cent; tuberculous, 11 per cent; pyogenic, 6 per cent; gonococcal, 3.7 per cent; syphilitic, 3.7 per cent; and hemophilic, 2.5 per cent. Oftentimes it is difficult to evaluate the symptom of joint pain because frequently trauma has been involved. On occasion the affliction seems to be so mild as to cause no complaint but rather to be manifested by a slight limp. Pain when it occurs in the upper extremity is more apt to be due to rheumatic fever than to fatigue or postural abnormalities. Fatigue pains often compel the child to call for the mother to massage the involved extremity after he has gone to bed; on the other hand, rheumatic pains tend to subside when the child has snuggled up and is warm in bed. Fatigue pains are common in the preschool child, whereas pain of rheumatic origin has its greatest frequency in the school-age child. Young white adults with acute rheumatic fever are apt to have pain, redness, swelling and tenderness of the joints with multiple and migratory involvement.[6]

Carditis.—The variation in heart manifestations is extreme. One child may be found to have a murmur with no previous disability whereas another may suffer from congestive heart failure. It is becoming apparent that active rheumatic carditis is found more often in older subjects than was supposed previously. Wroblewski and Messinger[7] found active rheumatic carditis to be not uncommon in patients over 40 years of age but oftentimes the symptoms are very obscure. Sprague and Carmichael[8] found evidence of rheumatic carditis, old or recent, in 115 of 1,025 consecutive autopsies in patients over 50 years of age. Appel and Kossmann[9] studied the clinical course of 71 patients over 60 years of age with rheumatic heart disease. Of 20 patients who came to necropsy a relatively high proportion (40 per cent) had been misdiagnosed and they believe that rheumatic heart disease has a greater incidence in the aged than was previously suspected. The peak age for active rheumatic carditis is the school-age group; however, experience during the past decade, especially in the Armed Services, indicates that adolescents and young adults frequently have inflammatory activity of the heart tissues.

Chorea Minor.—There continues to be some question as to whether or not patients with the combination of symptoms of dystonia, muscle weakness and emotional disturbance actually are afflicted with rheumatic fever.[10] A large portion of patients who have rheumatic fever develop Sydenham's chorea at some time or other, but it is well known that the incidence of carditis is not great in patients who suffer from chorea without other evidences of rheumatic fever.

Subcutaneous Fibroid Nodules.—These are almost pathognomonic for rheumatic fever. Their occurrence is reported to be in only about one-eighth to one-fifth of the patients afflicted and the duration of this manifestation often is a matter of days or weeks; hence the chances of their being found in any particular patient at a given time are not great. It is certain, however, that the more intensively they are sought for the more frequently they are found.

Skin.—Rheumatic annulare is also almost pathognomonic of the disease but the duration of the eruption is so short and the incidence so infrequent that the skin manifestations do not often assist in making an unequivocal diagnosis.

Miscellaneous.—Nephritis, pneumonitis, pleuritis, orchitis, iritis and arteritis may be manifestations of rheumatic fever but they are all quite infrequent as isolated manifestations.

Constitutional.—The symptoms of anorexia, pallor, easy fatigability, irritability, failure to gain weight or even weight loss, sweating, low grade fever, recurrent upper respiratory tract infections and epistaxis are found frequently in patients with rheumatic fever. LeBus and Panos[11] in their study of 91 children found symptoms in this category to be present in a high proportion of patients with rheumatic fever. In 10 of the 91 subjects they were the only manifestations of the disease.

Laboratory Aids in Diagnosis.—Intensive efforts have been and are being made to find some particular laboratory test or tests which will help spectacularly in making the diagnosis of rheumatic fever. The fact remains, however, that one must continue to rely upon an understanding of the symptoms and integrate the clinical findings with various laboratory data: erythrocyte sedimentation rate, leukocyte counts, electrocardiographic and roentgenographic findings. Extensive studies have been made of the blood antistreptolysin titer, antihyaluronidase activity, gamma globulins, antistreptokinase, streptococcal agglutinins, streptococcal desoxyribonuclease, serum complement and heparin resistance, but no procedure has been found to simplify diagnosis greatly. Kelley, Good and McQuarrie[12] found mucoprotein tyrosine values to correlate particularly well with the various findings in patients with rheumatic fever. Adams *et alii*[13] found that in patients who had been given ACTH the mucoprotein values follow the clinical course quite closely. The QT interval has been studied carefully in recent years and is believed to give additional aid in diagnosis. In most of the studies of new laboratory procedures the results are compared with the erythrocyte sedimentation rate as well as the clinical findings. In other words, the erythrocyte sedimentation rate continues to be the single most valuable laboratory tool to assist in diagnosis of active rheumatic fever. It is valueless unless interpreted with all other findings and its greatest usefulness is in periodic determinations.

Quite lacking among the many new observations in rheumatic fever is the discovery of the fundamental nature of the mechanisms involved, the true etiology. It has been recognized for many years and evidence continues to accumulate that the disease is related to hemolytic streptococcal infections. The usual sequence is considered to be an initiating group A streptococcal respiratory tract infection, a latent interval from one to three weeks, then the period of rheumatic activity. Failure to define the exact or specific role of the streptococcus infection has proved a disappointment. The observations of Wilson[14] and others that the disease occurs as a recessive trait compels attention to the consideration of the hereditary factor in the etiology and the pathogenesis. For a long time the typical finding of the Aschoff body has been considered specific for rheumatic fever. Valdés-Dapena and Valdés-Dapena[15] studied the hearts of 63 patients who died from tuberculosis, 13 of these had granulomatous lesions of the myocardium and in seven, the authors said these were identical with Aschoff bodies.

RESPONSIBILITY: PRIVATE AND PUBLIC PROGRAMS, PRIVATE PHYSICIANS

Another feature of the rheumatic fever problem which has been drawn into the medical limelight in recent years has been a consideration of the value of convalescent homes, diagnostic and treatment centers under both private and public auspices. Although it is realized that the problem is particularly important from the public health viewpoint, the fact remains that most children afflicted with rheumatic fever frequently are solely under the care of the family physician in the home. In the study made by the American Academy of Pediatrics a few years ago it was revealed that three-fourths of children are cared for by physicians in general practice. Collins[16] found that six out of 10 children with rheumatic fever were taken care of entirely at home by the private physician. This observation in itself stresses the necessity that every physician who sees children in his practice be well versed in the rheumatic fever problem, especially in the diagnosis and the details of management during the acute, subsiding and quiescent phases of the disease. The medical school has a particularly important role, namely: to acquaint the future physician with all aspects of this disorder. For this reason each and every medical school should have access to children in all phases of the rheumatic state so that satisfactory teaching may be accomplished. This is sadly lacking in many schools.

THERAPY

An outstanding feature in our new horizon is the disappearance of clinical symptoms of rheumatic fever upon the administration of cortisone or adrenocorticotropic hormone.

One of the unexplained phenomena of acute rheumatic fever is its age incidence of onset (the school-age child five to 15 years) and the incidence of recrudescences before and after puberty (five to one). It would not be surprising then to find that hormones play a role in this disease. Brewer[17] from 1946 to 1950 treated 64 patients with polyarthritis or carditis by the simultaneous administration intramuscularly of 500 mg. of progesterone and 33.3 mg. of estradiol benzoate with four to eight days between injections. In children under 15 years of age, one-half this dosage was given. The results were considered satisfactory in 49 patients and slight in five, whereas in the remaining 10, there was no change. Within 3 to 8 hours there was symptomatic and obvious improvement and all the symptoms had disappeared by 48 hours. The findings of euphoria, drowsiness, mammary enlargement, uterine withdrawal bleeding, slight decrease in libido in the male were noted. The effect was temporary but the authors felt that the results were similar to the effects of ACTH.

From many sources the flare on the rheumatic fever horizon seems almost as spectacular, figuratively speaking, as that of the atomic bomb. Just as we are anxious to attain the answer to many questions involving the atomic bomb problem are we anxious to obtain an exact idea of the significance of these hormones in the rheumatic fever problem. In the current issue of the *American Journal of Diseases of Children,* Barnes, Smith, Slocumb, Polley and Hench[18] have reported in detail on 16 patients with rheumatic fever who have been given cortisone and ACTH. The patients in this report include the three patients who were cited in the original report in May, 1949. The authors say that many of their patients suffered a flare-up of symptoms shortly after the hormonal therapy was discontinued. There is no doubt that critical attention must be given to the results reported from all over the world regarding the patients treated with cortisone and ACTH. It is becoming increasingly apparent, however, that the effect seems to be of the nature of a drug giving symptomatic relief rather than a curative agent. A report pointing out the therapeutic limitations was given at the recent (October, 1951) meeting of the Texas Pediatric Society by Fashena of Dallas. Inasmuch as the character of the patients and type of treatment varies greatly from one part of the country to the other or from one clinic to the other, it perhaps will be some time before the true role of adrenocortical hormone therapy can be evaluated. The American Council on Rheumatic Fever is fostering a study in six clinics in this country, seven in England and one in Canada, in which the same criteria for diagnosis and interpretation of results are being used. Hence, it will be possible to make significant comparisons and evaluations. It perhaps will be only after studies have been carried on for some years that the true role of hormonal therapy will be known, in relation to its value as a diagnostic test, therapeutic helpfulness and effect upon ultimate cardiac damage.

Salicylates continue to occupy position number one in relation to therapy in rheumatic fever largely because of the almost specific symptomatic relief of pain and fever. Studies have been made which indicate, however, that paraminobenzoic acid[19] alone, also plus salicylates,[20] sodium gentiate,[21 22] sodium resorcylate,[23] and ascorbic acid[24] seem to exert favorable effects on the disease. None of the medications has the specificity of antibiotic agents in certain diseases, for example, of penicillin in early syphilis.

We may take one more look into the horizon. Here we find developments in the field of cardiac surgery.[25–28] Encouraging reports indicate that there may be surgical relief to stenosed valves of the heart. This feature is especially important for older subjects with long standing rheumatic heart disease.

Prevention.—One of the significant advances in the rheumatic fever problem has been the prevention of recurrences, and most authors agree that sulfa prophylaxis is extremely beneficial in this respect. In a summary[29] of nine groups of workers several years ago, there were 18 recurrences in an experience of 885 patient-seasons in patients who received sulfa and 140 recurrences in 723 patient-seasons in those who were not given the benefit of sulfa administration. In recent years attention has been given to the role of penicillin for prophylactic purposes. A number of studies[30–32] have disclosed that penicillin given intramuscularly in dosages of 120,000 to 400,000 units daily or by mouth in dosages of 100,000 to 1,000,000 units daily is effective in

reducing recurrences. Brick *et alii*[33] administered 50,000 units of penicillin orally twice daily for two years (fall, winter and spring) to 38 children with inactive rheumatic fever with three recurrences, whereas six recurrences developed in the 38 children in the control group. Unfortunately there has been no controlled study comparing any particular method of penicillin administration with the usually accepted sulfa prophylaxis routine, namely, 0.25 grams twice daily for children under nine or ten and 0.5 grams for children over that age. The cost of the administration of penicillin compared with that of sulfonamides often is the factor determining the prophylactic agent of choice. No matter what the cost may be it must be emphasized that a program of some type should be instituted.

If it were possible to obtain frequent nasopharyngeal cultures of patients with rheumatic fever it might well be that penicillin administration given at the time hemolytic streptococci were found would serve as a satisfactory prophylactic measure. It has been conjectured that some of the decrease in the incidence of rheumatic fever may be due to what may be called the rather indiscriminate use of penicillin in patients suffering from acute sore throats and pharyngitis. At the same time there arises the problem of penicillin resistance. Denny and coworkers[34,35] made observations on 1,634 patients with streptococcal throat infections. Only those patients were included who had exudates on the tonsils or pharynx. Of 798 patients with acute streptococcal infection, 253 received 300,000 units of crystalline procaine penicillin G intramuscularly soon after admission and the dose was repeated in 72 hours and 545 received 300,000 units on admission and again in 48 hours and 600,000 units in 96 hours. Follow-up studies three-four weeks later showed that only two patients subsequently developed acute attacks of rheumatic fever. Of 804 patients who were similarly afflicted but had not been given penicillin there were 17 attacks. In the recent report from the Streptococcal Disease Laboratory,[36] 1,178 patients with streptococcal throat disease were treated with penicillin and two subsequently developed attacks of rheumatic fever, whereas of 1,162 patients similarly ill who were not given penicillin, 28 developed acute attacks of rheumatic fever. It would seem, therefore, that the widespread use of throat cultures for ascertaining the presence of hemolytic streptococci in patients acutely ill with upper respiratory infections and the administration of penicillin for a period of one-half to one week for those with positive cultures may reduce decidedly the incidence of the initial attacks of rheumatic fever as well as the recrudescences. In patients with a family history of rheumatic fever special attention should be given to the child nearing school age with the view that the onset of rheumatic fever may be prevented by penicillin administration when he is afflicted with an acute sore throat due to hemolytic streptococci. In the absence of throat cultures to guide the physician, it would seem that the presence of acutely inflamed tonsils and pharynx with punctate areas of exudate plus a regional lymphadenopathy is sufficient evidence to indicate the use of penicillin prophylactically. The dosage, interval and duration may vary from 200,000 units to 600,000 units initially, followed by administration daily or every other day for one-half to one week. It may be that one injection of penicillin, followed with the use of 200,000 units once or twice daily on a fasting stomach for a period of a week, could be practical. However, it must be emphasized that no specific recommendations can be given at this time.

A satisfactory penicillin prophylaxis program should be worked out for dental extractions, operations of various types, as well as streptococcal infections in order to reduce the incidence of subacute bacterial endocarditis which, with one exception, congestive failure, is the most common complication of rheumatic heart disease.

In closing, in the consideration of new horizons in the rheumatic fever problem from our viewpoint as physicians we may perceive the following points. (1) The outlook is becoming more favorable, yet it remains one of our most important problems in school-age subjects. (2) The key to success in combating the problem is thorough understanding of the manifestations, particularly because laboratory aids in diagnosis continue to be limited in value from a practical viewpoint. (3) The practicing physician is mainly responsible for the solution of the problem and he must utilize all professional and community facilities available to give each child the best possible chance to live a normal life. (4) The specific role to be played by the adrenocorticotropic hormones and cortisone in this problem remains an enigma. (5) Promising results from the surgical relief of severe valvular

stenosis brightens the picture somewhat. (6) Sulfonamides have assisted greatly to reduce the incidence of recurrences. (7) Penicillin administration continuously or sporadically appears to reduce recrudescences but the most satisfactory type of prophylaxis is yet to be worked out. Penicillin can reduce decidedly both the initial attack and recurrences. (8) So many features of the rheumatic fever problem remain to be solved that it is the duty of all of us to give active support to all types of investigative efforts. Some mirage in the distance may prove to be the real thing to help us solve the greatest single disease condition causing death and crippling in school-age children.

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THE LIFETIME WEIGHT CURVE AND CORONARY ARTERY DISEASE*

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The relationship of body weight to coronary artery disease is a matter in which the evidence appears to vary according to the method of study employed. Thus, when autopsy material is considered, Wilens[1] has shown a marked increase in atherosclerosis in obese persons. Similarly, when mortality figures are reviewed, it has been shown that there appears to be a definitely higher mortality rate from cardiovascular disease in the presence of obesity, in both men and women.[2,3,4,5] However, when tables of predicted "normal" weight are consulted, patients suffering from coronary artery disease would not appear to be grossly overweight, as a group, in comparison with normal subjects.[6] Furthermore, at least in women, Ackerman and his associates[7] were

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unable to demonstrate any differences in the degree of coronary sclerosis (based on a study of 600 hearts) in the overweight as compared with the normal weight group. The latter authors, however, did show that coronary atherosclerosis was less severe in the undernourished. From these foregoing studies it is apparent that while there appears to be some relationship between increased body weight and coronary artery disease, this relationship is not a consistent and invariable one.

In an effort to delineate some of the patterns of variation from normal weight, detailed weight histories were taken in a series of 250 patients suffering from proven coronary artery disease. From this pattern certain fundamental patterns of variation in weight, from the adolescent period onward, were obtained. From these groupings of variations in the lifetime weight pattern, certain inferences can be drawn to help to explain the confusion that exists regarding the relationship between obesity and coronary artery disease.

A study of the data revealed that certain general groups could be delineated in searching for patterns of the lifetime weight history. These main groups are discussed below.

(1) *Middle Age Patients with Progressive Weight Gain.—Fig. 1* shows the lifetime weight curve obtained from careful questioning of a patient in the fifth decade. It will be seen that the patient gained weight fairly steadily between the third and fifth decades, and that he sustained an acute myocardial infarction at the age of 46. It should not by inference be assumed that the weight gain, *per se*, in this period was necessarily causative of coronary artery disease. Nevertheless, such a pattern, terminating in angina pectoris or coronary thrombosis, was a very frequent one in our experience. In this connection it has been shown by Gofman and his associates,[8] that an increased concentration in the blood of large lipoprotein molecules frequently begins in the third decade in many male subjects. It is probable that during this period of continued weight gain the transport of lipid substances and their deposition in the coronary artery tree was going on in this patient at an abnormally rapid rate.

(2) *Young Patients with Progressive Weight Gain.—Fig. 2* shows the lifetime weight curve of a patient who sustained an acute posterior myocardial infarction at the age of 28 years. This

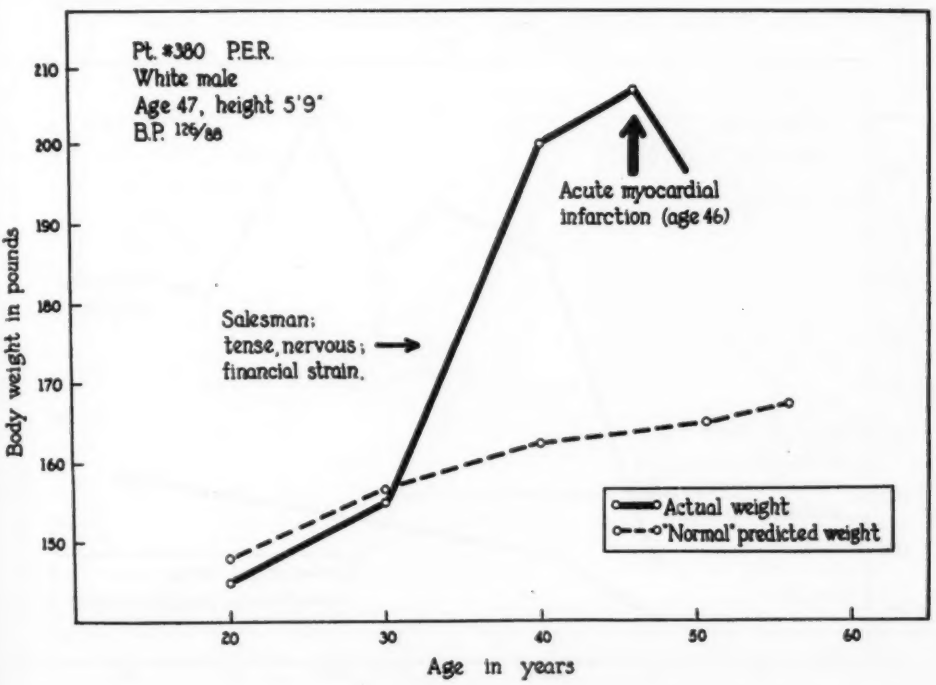

FIG. 1

patient's rapid gain of weight appeared during a period of extreme emotional stress in adolescence. Although several young patients were included in this series not all of them showed such striking evidence of weight gain. The actual cause for the rapid deposit of lipid substances in the coronary artery disease of some young men could not be wholly ascribed to rapid weight gain. Nevertheless, the evidence is suggestive that during such periods of rapid gain, deposition of lipid substances must have occurred.

(3) *Middle Age Patients without Obesity and with Coronary Artery Disease.—Fig. 3* reveals the lifetime weight curve of a white man whose body weight during most of his lifetime was actually below that predicted on the basis of so-called normal height and weight tables. In spite of the maintenance of normal bodily weight he sustained an acute myocardial infarction at age 43 years and was left with residual angina pectoris. Again it must be concluded that an abnormally rapid rate of deposition of lipid substances occurred in the coronary disease of this patient in spite of any evidence of gain of body weight.

(4) *Patients with Complicating Diabetes or Hypertension.—Fig. 4* reveals the lifetime weight curve of a white woman who was found to be hypertensive several years before the development of angina pectoris. It will be noted that this patient had a normal weight curve throughout her lifetime when compared with predicted normal weights at various ages. That hypertension, diabetes, and diseases such as hereditary familial hypercholesterolemia accelerate the development of coronary atherosclerosis is well recognized. Frequently, but not invariably, these states are associated with obesity. However, even in the absence of excessive weight gain the patient may develop signs and symptoms of coronary artery disease, even at a relatively early age. In this connection the well known tendency of women to be relatively immune to coronary artery disease before the age of 40 is worth consideration. This apparent immunity of the female in the first four decades of life generally holds true except for the associated development of one of the above complicating diseases. It must be concluded that in the presence of such complicating disease states, the body weight curve cannot be relied on as an indication of the tendency to develop atherosclerosis.

Periods of Rapid Weight Gain.—In reviewing the series of patients on whom weight histories were obtained, it was evident that certain

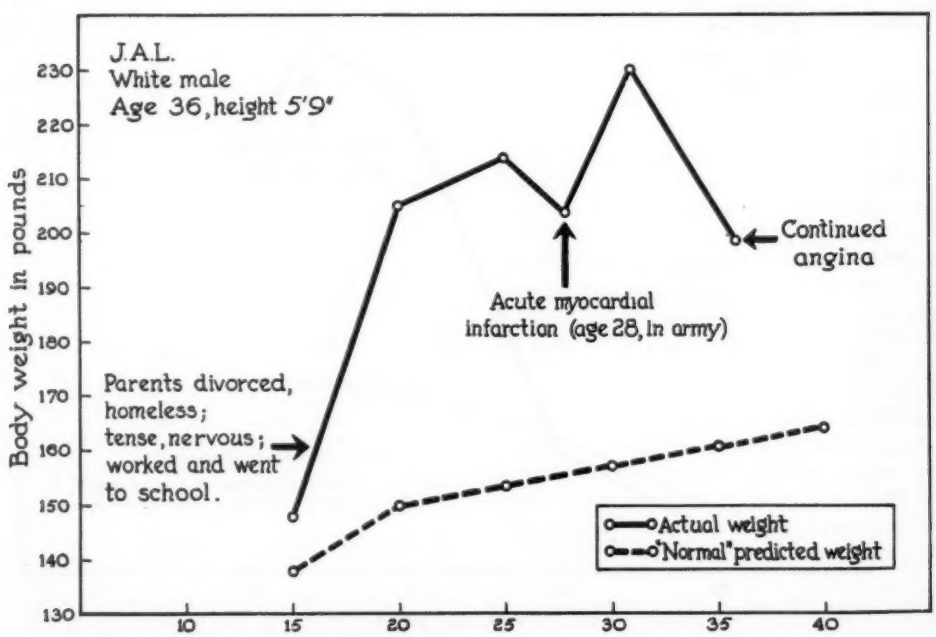

FIG. 2

tendencies could be discovered. The most common tendency was one of increasing weight with increasing age. This usually became apparent in the fourth decade, and was associated both with sedentary occupations and the continued ingestion of a high caloric diet.

Other striking tendencies were observed that were apparently related to situations of stress.

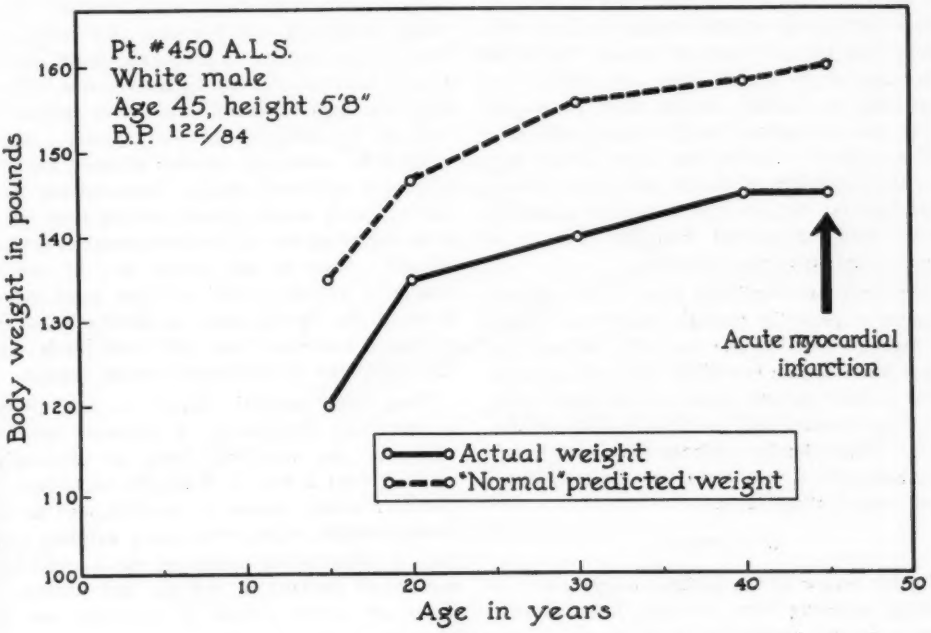

FIG. 3

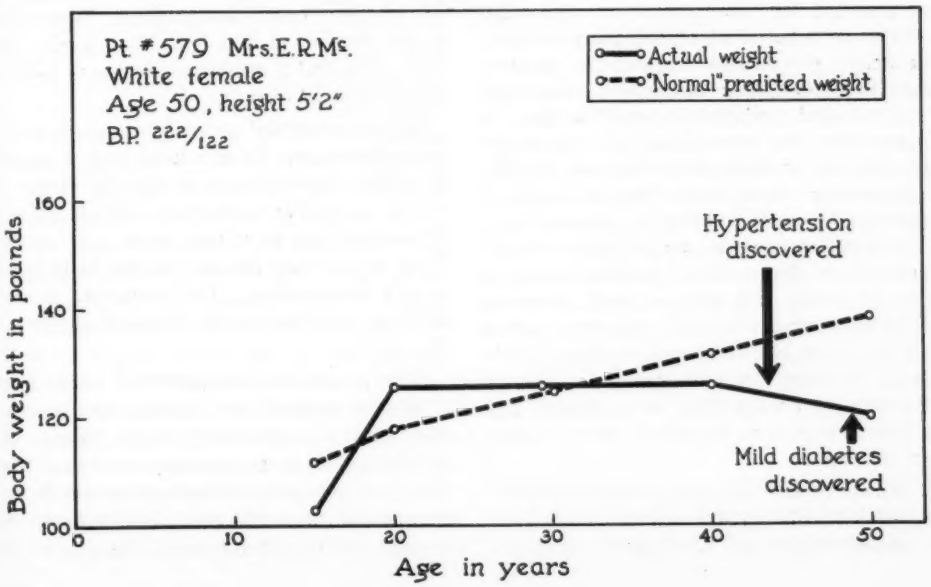

FIG. 4

It was evident that many patients gained weight during periods of nervous and emotional strain, often in a period of a few months. This period of nervous tension may or may not have been directly casually related to the weight gain, but by inference such a relationship can be assumed. Other periods of unusual stress, such as pregnancy and the post partum period, were often associated with weight gain, the subject not regressing to normal weight after pregnancy. Some men also gained weight during periods of military service. During this latter period there was the possibility of weight gain either from a rich, high fat diet, or from a marked change in eating habits associated with the presence of nervous and emotional tension.

Finally it was found that many of the subjects retained a perfectly normal "predicted" weight throughout their lifetime and still suffered coronary heart disease in middle life or later years. Some of these patients developed associated complicating diseases such as hypertension or diabetes. Other slender patients developed symptoms and signs of coronary artery disease without these complicating factors.

DISCUSSION

In this review of the lifetime weight curve of patients suffering from coronary heart disease, certain general tendencies were noted. It was apparent that in some patients a period of weight gain preceded the development of myocardial infarction by a period of several years or more. This weight gain usually elevated the patient's weight to a level only moderately above that of the so-called predicted "normal" weight. It appeared that the commonest type of weight curve was one in which the patient was slightly to moderately obese, according to empirical standards. In another group of patients there had been rather excessive weight gain to levels clearly above the predicted normal during a period of years. Still another small group of patients maintained their body weight at normal levels, or below, and developed coronary artery disease. However, excessive gain in weight, or a tendency to remain thin, were unusual and relatively rare patterns in patients with coronary artery disease.

It cannot be assumed that a cause and effect relationship necessarily was present in all patients who gained weight and subsequently developed coronary artery disease. Nevertheless, this sequence of events was so common and so striking, it appeared difficult to escape the conclusion that some direct relationship between obesity and coronary artery disease existed. The exact nature of this relationship is still obscure. From recent studies it would appear that high lipid blood values apparently predispose to the deposition of lipid materials in the arterial tree.[8] However, the importance of local tissue factors, as well as the influence of the hereditary background in producing arterial disease, are still relatively unknown factors. Furthermore, from our studies it would appear that the time factor is an important one in the development of arterial disease. Thus at any given rate of arterial change a certain period of time must elapse between the development of obesity (and the presumed associated high lipid blood levels) and the occurrence of developed arterial disease.

That such arterial disease is not always accompanied by obesity is apparent from a study of our material. Such an illustrative case is shown in *Fig. 3.* While the occurrence of coronary artery disease in patients who are of normal weight or below was not a frequent finding, it nevertheless occurred in a sufficient number of patients to indicate that obesity of slight or severe degree is certainly not an essential factor in developing coronary artery disease. As mentioned above it is also apparent that associated complicating disease, characterized by the presence of high lipid blood levels, (diabetes, etc.) tend to accelerate the rate of development of arterial disease.

The occurrence of coronary artery disease in thin patients may be associated with a marked hereditary predisposition to vascular disease as well as a possible tendency to deposit lipids in the arterial tree at a rate faster than normal. These factors may account for the development of such abnormalities. The interaction of these factors is indicated in the schematic diagram in *Fig. 5.*

When a statistical comparison of weight levels in "normal subjects" and patients with coronary artery disease is considered, certain inherent difficulties appear in the evaluation of clinical data. Thus, it is extremely difficult to be certain that the so-called "normal" group is completely free of degenerative atheromatous changes in the

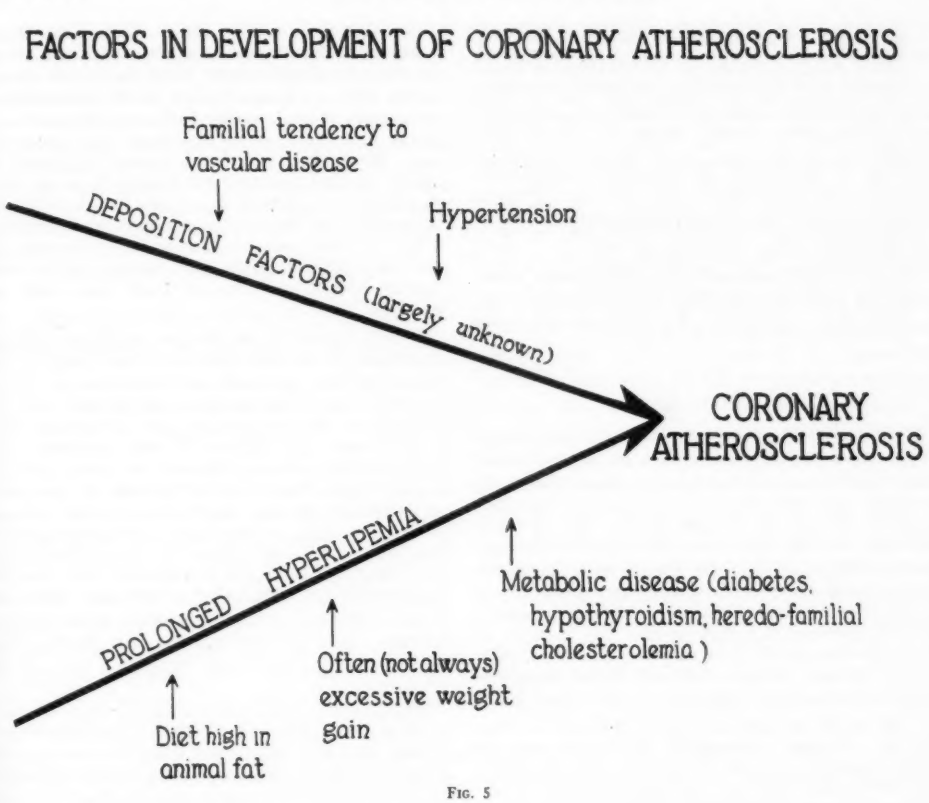
FACTORS IN DEVELOPMENT OF CORONARY ATHEROSCLEROSIS
Familial tendency to vascular disease
Hypertension
DEPOSITION FACTORS (largely unknown)
CORONARY ATHEROSCLEROSIS
PROLONGED HYPERLIPEMIA
Metabolic disease (diabetes, hypothyroidism, heredo-familial cholesterolemia)
Often (not always) excessive weight gain
Diet high in animal fat

FIG. 5

arterial tree. Such changes generally remain occult until occlusive phenomena develop in the coronary circulation. Supposedly "normal" obese subjects, who at the time of examination do not have overt symptoms of coronary artery disease, may actually be suffering from atheromatous changes of the coronary vessels. Hence the comparison of average body weight in a so-called "normal" group with a group of patients suffering from coronary artery disease might yield results that appear to be little different in the two groups. For this reason it would appear wiser to take a detailed weight history in each individual patient, rather than to compare his weight with predicted normal values. By a careful consideration of the patient's weight curve, plus an evaluation of associated factors, such as the family history and the presence of other diseases (featured by abnormalities of liquid metabolism), a more accurate assessment of the patient's clinical status may be achieved.

SUMMARY

Lifetime weight histories were taken on a series of patients with coronary artery disease. The majority of the patients showed a tendency to slight or moderate obesity prior to the development of symptoms of overt disease. A small group of this series revealed lifetime weight curves which were not abnormal when compared to predicted "normal" values. The importance of high blood lipid values as well as the relationship of unknown factors tending to early degenerative processes in the coronary artery tree is discussed. In evaluating the body weight of a given patient it appears preferable to study the lifetime weight curve rather than to compare the body weight to empirical standards.

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DISCUSSION (*Abstract*)

Dr. Robert M. Barton, Dallas, Tex.—We are indebted to Dr. Heyer for emphasizing a relationship between body weight curves and coronary atherosclerosis. The profession has been slow in accepting the idea that disease of the coronary arteries is other than a "wear and tear" disorder and other than simply an aging process. Marchand in 1904 first coined the phrase "atherosclerosis" and Aschoff first demonstrated that its fatty lesions contained crystalline esters of cholesterol. He was, however, uncertain whether the presence of cholesterol was casual or causal even as late as 1924, and his influence dampened interest in the cholesterol hypothesis as the main etiologic factor in atherosclerosis.

Today we think more and more that atherosclerosis may be a disorder, preventable at least in part by dietary measures. It seems hard to deny that the diseases associated with hyperlipemia do show an earlier tendency to coronary disease. Gofman has shown that the qualitative study of serum lipids and special lipoproteins yield interesting findings in persons with coronary disease or in those who are candidates for it.

Thinking in terms of prevention, we like to recall the work of Vartisinen and Kanerva from the University of Helsinki. They found that the amount of atherosclerosis in endocardium, aorta, coronary arteries and brain arteries at autopsy during the war years 1940-46 as compared to good years of 1933-38, differed little in patients under age 30 and over 70, but was twice as common in peace time in the age group of 30-39. In Finland atherosclerosis was given as a cause of death during peace time about twice as commonly as in war years. During war years there was a shortage of butter, grain, eggs, milk and meat, the deficiency being largely met by potatoes and rutabagas. Loss of weight was common. These figures are corroborated by others, emphasizing the adage, "More people die by the platter than by the sword."

Until we know more about the subject, it seems sensible to urge low calorie diets, and reduction of weight to standard or below standard figures, without becoming too enthusiastic about any single dietary factor such as cholesterol. If cholesterol is not ingested, the body proceeds to synthesize it from acetate. Wilkinson has emphasized that where there is lessening of atherosclerosis and of hypercholesteremia by whatever method, the common denominator is loss of weight.

Dr. Martin S. Buehler, Dallas, Tex.—I am entirely in agreement that when one discusses weight and obesity, the standard normal weight tables are by no means a reliable index of normal weight. In the preparation of the average normal weight charts no allowance is or can be made for excessive or unusual bone and muscle mass. Hence, the 5 foot, 6 inch Italian, large boned and heavily muscled, weighing 185 pounds, is by no means 50 pounds overweight as our present tables would seem to indicate. Dr. Heyer's suggestion of using individual weight histories plus recognition of progressive and apparently excessive weight gain, especially in the middle decades would appear to be much more valid and significant.

Second, it seems to me that our psychiatric colleagues are at least on the right track when they speak of obese patients as being psychoneurotic individuals. In fact, as Dr. Wilkinson of New York has pointed out, such obese patients may often strenuously resist a reduction in the total quantity and calories of their customary foods and yet readily accept a change in the gross appearance of their calories, such as substituting rice for potatoes in an individual who has always been a large consumer of potatoes. Such an individual's carbohydrate intake is thus often rather easily reduced by the elimination of a food which has perhaps been associated with a neurotic background. Dr. Wilkinson has had quite outstanding success with such a substitution diet in so-called intractable obesity. I feel that such cases are an obvious association of obesity plus tension, if not actually neurosis.

Third, most of us have seen diabetes or hyperglycemia, hypertension, angina and significant electrocardiographic changes appear in obese individuals and then even disappear completely when they return to a normal weight. We have seen these findings appear and disappear several times in a patient who grossly gains and loses weight up and down over a period of time. In my experience, if an individual continues such a game with nature he always loses and eventually most or all of these abnormal changes will persist even though he reduces his weight once again, but unfortunately, now too late. Hence, the time factor appears extremely important and yet the answer regarding the reversibility of these findings remains unanswered.

As Dr. Heyer pointed out, we know that certain diseases, such as hypertension and diabetes, accelerate coronary artery atherosclerosis. It would appear logical to follow his curves, and while recognizing the association of such diseases with obesity, to believe that obesity *per se* or tension might well result in similar damage to the coronary arteries, even without the previously mentioned complications.

Fourth, the incidence of atherosclerosis in the war or lean years and in the peace or fat years in Germany and Scandinavia again emphasizes the importance of obesity and the high animal fat diet, but most interestingly would seem to depreciate the tension factor.

Last, there are definite limitations in completely evaluating this problem, namely: having a true normal (as we cannot be certain our "normals" are free of atherosclerosis and we cannot measure the hereditary factor) and determining what is a normal weight at a certain age and height, as well as our inability to

measure the effect of stress and strain. The use of individual weight histories is a step forward in removing one of these limitations. In all probability a better understanding of lipoid metabolism is not far off, so that a more complete correlation may soon be obvious.

In closing may I remind all of us that atherosclerosis and arteriosclerosis are not at all synonymous. I believe Dr. Heyer has helped to explain some of the reasons why insurance actuaries have for long been extremely wary of an abnormal weight curve in the life of any individual.

THE PROBLEM OF SCHOLASTIC DEFICIENCIES IN MEDICAL SCHOOLS*

By A. J. GILL, M.D.†
Dallas, Texas

One of the many dividends to be derived from a policy of high standards and careful selection of applicants to most present-day schools of medicine has been a decline in the frequency of the tragic occurrence of scholastic deficiency in students who have actually been admitted to medical school. I know of no more painful problem in the whole field of medical administration, as concerned with student affairs, than the matter of deficient performance in some phases of actual academic work. This problem is not only painful from an emotional point of view but has other implications of real concern to society in general, which quite outweigh any personal considerations of the deficient student himself, his family, or the feelings of medical school faculties, which in my observation are usually extremely sympathetic and concerned over student problems. One has only to mention the matter of the high cost of medical education, only a small fraction of which is borne by the individual student, to note one of the most important considerations of academic failure. It is self-evident that any cost in connection with training such a student represents a loss to the taxpayers, in the case of state schools, or the endowments of private schools, and in either case the loss is a serious matter. Another consideration which weighs heavily with us is the fact that a student who fails to make the grade in medical school has occupied a place which could have been held by any one of hundreds of other men who, while qualified, nevertheless had to be rejected because of the limited number which could be accepted because of limitations of space and faculty. Speaking personally, this matter of keeping a qualified man out is probably worse than any of the admittedly large number of bad features in the whole problem of academic failure.

We, like most other schools at the present time, have been much preoccupied with the best ways and means of selecting medical students and make use of all the usual technics, including personal interviews by panels, aptitude test scores, and careful evaluation of the college record. Like most, we are prepared to subscribe to the view that the best single indication of likely performance is in the record of proved achievement, as shown in the transcript of the student's academic college work.

I should like to say at this point that the majority of the views expressed here represent my personal opinion, as of this time anyway, and I should like to express one of these opinions now which is somewhat contrary to a widely accepted feeling both in lay and medical circles. It is desirable to express this view now, since it bears upon some future remarks. In short, I wish to take issue in the very beginning with the idea that the medical school curriculum is difficult work that requires more than average intellectual capacity. I submit to you that there is no part of the medical school curriculum which is really difficult. I know of no course, or combination of medical courses, which should offer any serious obstacle to any reasonably well prepared student. I am well aware of the fact that there may be serious disagreement over what constitutes "reasonable preparation." I do not wish to become involved in discussion of the whole area of premedical preparation at this time, because it invariably becomes confused with such issues as how much cultural education and humanities the prospective student should have before admission and whether or not a degree should be required. None of this is strictly germane to the discussion at hand which, I wish to remind you, has to do with actual scholastic deficiency in technical medical school subjects by students already entered upon the general study of medicine. Let me hasten to say that by "reasonably well prepared" we have in mind those minimum requirements in biology, chemistry, physics, and language which enable the student to enter into his medical school with the

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basic terminology and basic ideas necessary to proceed with the work of similar type in either chemistry or biology which he is to encounter. We do not minimize the importance of the student's broader cultural education, but for the work in biology, physics, and chemistry of the medical school curriculum it is essential that the student have a good foundation because there is no time or place in the school of medicine to teach the basic terminology and fundamentals of the sciences. In this country we must rely upon the undergraduate college to provide this basic groundwork. In Europe and in many English schools the medical school provides much of the fundamental premedical preparation in the six-year medical college curriculum. This may even be a good plan but, so far as I know, is not done anywhere in the United States.

I think, furthermore, that we should admit at the outset that one of the difficulties in a discussion of this type is like some of the art of medicine. Much of what one says and feels is not subject to actual statistical analysis, although the literature is replete with just such analyses of various subdivisions of the general subject under discussion here.

I feel very strongly that most of our students who gain admission actually have the absolute intellectual capacity to do the work of the medical school with no serious difficulty. It seems to me that, even with all the obvious shortcomings of many colleges and universities today, with mass production methods, and so on, almost any man who obtains a better-than-average record of scholastic achievement in the required work can be assumed to have the average mental equipment which seems to me to be all that is absolutely required to make a creditable, although usually not outstanding, showing in medical school. The term "average" as used here should be taken to mean the average person of comparable educational level.

I think that it is fair to say that a large proportion of our medical classes is made up of average men and women, using the word "average" as indicated in the preceding paragraph. I like to think, however, and in fact I honestly believe, that this group is of a higher-than-average type of selflessness and devotion to a work which they espouse by free choice and because they earnestly desire to do it. In this I think we have, perhaps, an advantage over any other professional group.

Having now taken the view that no part of the medical curriculum is really difficult, although one must in fairness admit that it is voluminous and that the sheer quantity of day-by-day material requires diligent application; having also expressed the opinion that most students who are actually admitted have the minimal required gray matter to handle the work; I am prepared to get to the point of making inquiry into the why and wherefore of academic deficiency.

In my opinion, the frequent causes are chiefly motivation problems, emotional disturbances, domestic problems, physical illnesses, and mental incapacity, apparently in this order. In many cases, more than one of these operate. There are, of course, many other causes not mentioned which may sometimes be the basis for scholastic difficulty.

It is, admittedly, very difficult to assess motivation and to gain the confidence of students and get such rapport that one can get accurate ideas of motivation. By way of example, let me mention several cases where careful sympathetic discussion discloses that a student has actually been directed, sometimes unconsciously, by an ambitious parent into doing all the preparatory work for entrance into medical school when in reality the student longs to be somewhere else. These are not rare by any means and there is no way to tell how many similar cases get by without overt scholastic difficulty even though the motivations are not good. I have known a few of these and they are not fundamentally happy people, which, of course, brings up the chance to remark that in cases of this kind there is nearly always a serious complicating emotional factor in which the individual may feel that he is a failure or has "let someone down" if he fails or, if he avoids actual failure, his work is not a source of happiness and pleasure but is, instead, a burden which he may resent through a lifetime. There are other men who lack proper motivation whose situation is somewhat different. They may, for example, have drifted into a premedical curriculum and, finally, to the point of applying to medical school, by drifting along lines of least resistance. Not infrequently these persons are of above average intelligence and ability. This may, of course, be said for many of the students who encounter academic difficulty. I strongly suspect that this group, which drifts by accident into the field of medicine, is

larger than is generally appreciated. Many other reasons exist for defective motivation and it is inevitable that many of these should be "found out" by appearing on the rolls of those having scholastic deficiencies.

Overt emotional disturbances, as a cause for scholastic failure, need no special consideration. These are not always so obvious, however, and must be assessed with care. Many cannot be detected easily by casual conversation with the registrar, or with the dean, or with his professors in hasty sidewalk conferences. These require patience, tact, and time. Backgrounds for emotional disturbances are often quite surprising and can be brought out only through the exercise of much time and effort. I think that this is not the place to discuss more serious types of psychiatric disturbances except to say that we prefer to have the evaluation of a specialist in the field.

Domestic problems are nearly always complicated by emotional difficulties and, in our view, it is often hard to tell which is primary and which is secondary. In recent years the matter of domestic relations has increased tremendously since the incidence of students with wives and children has greatly increased. Domestic problems are now given quite frequently as excuses for failure to do a good quality of work although it must be pointed out here that we feel that there is no great statistical difference in quality of performance between married and single students. In nearly every case where domestic trouble really exists, there is a considerable emotional disturbance which, I believe, seriously dissipates the student's ability to apply himself to the work at hand. In all fairness, the effects of domestic difficulty may be exaggerated and it is the feeling of some experienced educators that ordinary problems, domestic and otherwise, do not usually cause failure in capable students possessed of good strong motivation.

Organic illnesses, of course, require no very extensive consideration. In general, students with any severe illness recognize the source of trouble and solve the problem by leave of absence. I am always dubious about organic disease as a valid excuse for scholastic deficiency, although I am sure that it may occasionally be justified.

The last of the broad general causes which I have mentioned previously is mental inadequacy. It is my considered opinion that this is a very infrequent cause of academic failure. I know that it is a great temptation to specialists in various fields of medicine to feel that the student who fails to grasp all the intricacies of his specialty must be dull of mind. I feel, however, that in most cases of significant failure in any important segment of the work the difficulty is one of motivation or one or more of the other disturbances mentioned earlier. This may be a good time to suggest, however, that the whole complex emotional and motive pattern which any student exhibits toward his work may be modified to some extent by the inspiration and quality of his instruction. As a matter of fact, although this is extremely difficult to evaluate, I feel almost sure that this is very important in occasional course failures which may appear on the records of men whose entire record may otherwise be clear. By way of example, a good student may surprise everyone by failing one subunit course while doing very high quality work in all others. There is no doubt that in a few cases these otherwise unaccountable difficulties are a consequence of teaching failure. I know of at least one experienced medical educator who feels that many of the curious isolated deficiencies shown by admittedly capable students may be traced to failure of an instructor to inspire interest and pleasure in the material taught. It is his contention that there is no branch or subdivision of the curriculum which is really dull or uninteresting and to this I, also, subscribe. Obviously, this idea of teacher failure cannot be used to account for difficulties in many courses or throughout any important part of the curriculum. In my own mind there is some doubt about whether this is ever a very good reason, because I believe that any capable student with good strong motivations and a reasonably mature attitude can manage any segment of course work in spite of poor or deficient instruction. It simply means that the student's individual responsibility is somewhat greater.

The actual mechanics of handling the deficient student, the decision as to what is to be done when scholastic performance is inadequate, is tremendously variable and has been the occasion of much thought and work on the part of medical school faculties. Probably the easiest way, from the point of view of medical administration, is the system which provides for a rigid set of rules which allow no flexibility. In

such a system a failing grade may mean automatic dismissal or it may call for automatic repetition of part or all of a year's work. Regardless of the provisions in such rigid schemes, they are all founded in error, I believe, since they do not allow for individual circumstances, the extreme variations in human beings, and do not provide for exercise of reason or the weighing of possible causes. The provision of flexibility seems to us to be of increasing importance, although it adds tremendously to the burden of the deans and committees.

With this in mind, we have recently adopted a system which is similar to plans now being used in a number of schools. We have formed a promotions committee composed of representatives from nearly all departments of the medical school, both clinical and preclinical. It is the duty of this committee to inquire into all cases of deficient performance in any phase of school work and to make appropriate recommendations as to the best means of disposition. The way in which the committee proceeds in a specific case follows a fairly routine pattern. First of all, the entire record of the student, including the application for admission, the high school record, college transcripts, letters of recommendation, the actual medical school record, and any other information about him is made available to the committee. The second step is the designation of some one member of the committee as interviewer, and the student is carefully interviewed by this one individual in a private conference, with the aim in view of attempting to get the student's reaction and especially his own understanding of his difficulty. In this interview an effort is made to find out what insight, if any, he may have regarding his poor performance. The interviewer submits a detailed written report of his conversations. The third step in the procedure is a meeting by the full committee, where the entire history, including the premedical record, is carefully reviewed and the interviewer submits his report. The fourth step, which is essentially a continuation of the third step, is the optional appearance of the student himself before the committee to discuss the problem with the entire group. This interview is conducted in the most informal way and an effort is made to look upon the meeting as a means of aiding the student in his difficulty and actually giving sound advice as to future course. A sincere effort is made to make clear to the student that the promotions committee is set up to provide the best possible advice and counsel. Following the meeting of the student with the entire committee in informal discussion, and here it may be said that only occasional students do not avail themselves of this opportunity, the committee then deliberates and prepares a recommendation regarding disposition of the problem. They may recommend to the dean dismissal, repetition of all or part of a year's work, or some other make-up procedure.

This procedure, which by the way is not nearly so ponderous as it sounds, has the advantage of flexibility and meets the objections which can be raised against the fixed arbitrary way of handling such matters with some automatic mechanisms.

The more one examines this general problem of deficient students the more apparent it becomes that this is a much larger problem than is generally appreciated from looking at the fairly small number who actually turn up with deficiencies in course work. We are convinced that for every one who finally appears before the promotions committee there are several others who manage to get by with difficulty. This latter group is often known to the student health service, the psychiatric department, and to administrative officers, and recognized as being on the borderline of scholastic failure.

I think we can safely conclude that our methods of selection are still faulty. We do fairly well in our assessments of intellectual capacity and fairly good measurements of this quality are available to us in the records of proved past performance, as shown in college work of various kinds. Unfortunately, however, if our belief is correct, the main cause of loss is still not being recognized early enough. We have not a good reliable method of estimating motivation and emotional factors in prospective medical students. The personal interview is not the completely satisfactory answer to detecting potential academic failures, although I believe that it is very desirable to have careful interviews.

We believe that further study needs to be carried out with a view to improving our ability to assess motivation and emotional factors. It would not surprise me, however, if we finally conclude that losses from poor or distorted motivation or because of the other important causes of failure cannot be much reduced below present levels.

THE PROLONGED ADMINISTRATION OF CATION EXCHANGE RESIN AS A SUPPLEMENTARY MEASURE IN CONGESTIVE HEART FAILURE*

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Control of dietary sodium is well recognized as a necessary but often difficult factor in the management of patients exhibiting heart failure. The use of cation exchange resins, which are synthetically prepared ion exchangers, is now established as an effective supplementary tool in the treatment of such patients.

Ion exchangers are substances which remove cations or anions from solution by selectively releasing one ion in exchange for another. The principle of ion exchange has been applied both commercially and medically for many centuries, for example, in the use of sand for water purification and the use of certain types of clay in the treatment of heavy metal poisoning. Following the synthesis of the first cation and anion exchange resins by Adams and Holmes[1] in 1935, extensive commercial use has been made of resin ion exchangers in such processes as metal recovery, preparation of pharmaceuticals, and water softening. Since 1945, several reports have been published regarding the use of anion exchanger resins as antacids and pepsin inhibitors in the management of patients with peptic ulcer.[2-8] It was Dock[9] who, in 1946, first suggested that cation exchange resins be used for the removal of sodium from the body. At that time he made initial observations with regard to toxicity and fecal sodium content in laboratory animals to which cation exchange resins were fed. Irwin, Berger, Rosenberg, and Jackenthal[10] in 1949, using an ammonium-saturated sulfonic resin, demonstrated by balance studies its effect on serum, fecal and urine electrolytes in both normal human controls and in subjects with edema resulting from congestive heart failure and cirrhosis of the liver. It was observed that sodium was retained effectively in the gastrointestinal tract and excreted by the stool. In edematous patients diuresis was promoted and existing depots of fluid were removed. It was noted that potassium was removed by the resin in amounts sufficient to cause significant lowering of the serum potassium and clinical hypokalemia. Loss of calcium was not found to be great, but was considered to be a potential hazard, as was the possibility of clinical acidosis from loss of base, despite increased renal excretion of ammonia. Hay and Wood[11] described a group of ten patients with edema from cardiac failure, cirrhosis of the liver, and constrictive pericarditis. When the ammonium form of carboxylic resin alone was employed, hypokalemia was encountered. This problem was eliminated by the addition of potassium ions to the ammonium form of resin. These authors noted effective blocking of gastrointestinal absorption of sodium, and favorable results in mobilizing edema fluid in six of eight patients. Mercurial diuresis was found to be potentiated. Other observers have noted similar results in the treatment of edematous patients.[12-19] Martz, *et alii*[19] reported the use of a mixture of anion resin with hydrogen-potassium resin. It was thought that the addition of anion exchange resin decreased the load on the renal compensatory mechanism for maintaining acid-base balance, thus aiding the prevention of clinical acidosis. It has been agreed generally that definite renal insufficiency is probably the major contraindication to the use of cation exchange resins, because of the danger of uncompensated acidosis. Dock and Frank[20] have reviewed problems associated with the use of cation exchangers in the management of edema.

In our clinic we have observed the clinical response of patients with edema due to congestive heart failure in whom cation exchange resin* has been used to supplement conventional therapeutic measures. A number of patients with edema of varied origin have been given short courses of exchange resin therapy. We shall not report these cases at this time, except to note that our observations with regard to the mobili-

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*Resodec,® the ammonium-potassium form of the resin, was kindly supplied for experimental purposes by Smith, Kline & French Laboratories of Philadelphia, Pennsylvania.

zation of edema fluid, potentiation of the action of mercurial diuretics, and reduction of available dietary sodium closely parallel those recorded by other observers.[11-19] It is the purpose of this communication to report observations on the effects of long-term continuous therapy with a cation exchange resin in a selected group of patients suffering from severe long standing congestive heart failure who had responded poorly to conventional measures of therapy.

Seven patients who have received continuous cation exchange resin therapy for periods of from six to fourteen months have been selected for presentation because of peculiar problems presented by each. Each of these patients had been known to have severe congestive heart failure for at least several months with the exception of patient H. F., who was classified as having only moderately severe failure. Each patient in the past had been hospitalized because of heart failure, and for individual reasons, had responded poorly to conventional therapeutic measures, including rest, attempts at rigid dietary sodium restriction, digitalization, and mercurial diuresis. Three of these patients,* at the time of institution of resin therapy were considered therapeutic failures with extremely poor prognoses. Various problems pertaining to the use of exchange resins are presented by this group of patients. Before starting resin therapy each was stabilized on a regimen of rest, digitalis and regularly administered mercurials. Each patient was instructed repeatedly regarding the use of a strict diet containing approximately 0.5 gram (22 mEq.) of sodium, 1.27 grams (36 mEq.) of chloride and 40 grams of protein daily. Patient H. F., an exception, was allowed to remain on a diet containing approximately 1.0 gram (44 mEq.) of sodium daily. Detailed dietary instructions were given by a special dietitian, who interviewed each patient on return visits, paying particular attention to diet palatability, voluntary or involuntary dietary breaks, and to daily sodium intake as calculated from menus reported by patients. Control determinations of the serum concentrations of sodium, potassium, calcium, carbon dioxide combining power, and non-protein nitrogen, and of the twenty-four hour urine sodium and chloride were made for periods of two to four weeks before the administration of resin therapy. The powdered resin was prescribed in doses of 15 grams three times daily with meals. The resin was mixed with cold fruit juice, with water, or in some cases with food such as mashed potatoes or apple sauce. Added calcium was given as calcium lactate, 5 grams, or as milk, 16 ounces daily. Supplemental vitamins also were advised. Patients were followed at intervals of from one to three weeks, particular attention being given to unpleasant side effects of the resin, exercise tolerance, changes in weight, lung moisture and liver enlargement. On each return visit determinations of the serum calcium, potassium, sodium, chloride, and carbon dioxide combining power, and of the 24-hour urine excretion of sodium and chloride were made. Blood nonprotein nitrogen, hematocrit and hemoglobin values were determined at regular intervals. Phenolsulfonphthalein dye excretion tests were performed before and during resin therapy. In three patients the hydrogen-potassium form of carboxylic resin was substituted for the ammonium-potassium form for brief (2 to 8 week) periods during the course of continuous therapy.

Case 1.—J. H., a 42-year-old colored man, first experienced frank congestive heart failure in 1944, seven years before, at which time the diagnosis of rheumatic heart disease with mitral stenosis and insufficiency was established. Despite digitalization and attempted dietary sodium restriction, hospitalization was necessary a few months later, at which time auricular fibrillation was first noted. With conventional therapeutic measures he remained fairly well compensated until November, 1950, when a second period of hospitalization was required because of frank congestive failure. Following discharge, despite the continued use of digitalis, strict sodium restriction and weekly injections of mercurial diuretics, the patient reaccumulated fluid and remained quite dyspneic (*Fig. 1*). In January, 1951, cation exchange resin therapy was added to the therapeutic regimen, in a dosage of 45 grams daily for the following six months. During this period no further mercurial diuretic was given, and, despite the fact that he adhered less and less strictly to his diet, he gradually lost weight and became active enough to resume part time his former job as a cook. The patient experienced no untoward effects while taking resin. Sudden death occurred at home four days after his last clinic visit. At the time of this visit he was found to be in better than usual condition and exhibited no evidence of electrolyte disorder (*Fig. 2*).

This patient responded poorly in spite of recent hospitalization, digitalization, dietary sodium restriction and mercurials. The addition of supplementary resin therapy completely eliminated the necessity for frequent mercurial diuretics, and clinical improvement was apparent to all observers. No untoward effects were observed which could be attributed to resin therapy. Al-

*Preliminary observations in three patients have been reported.[21]

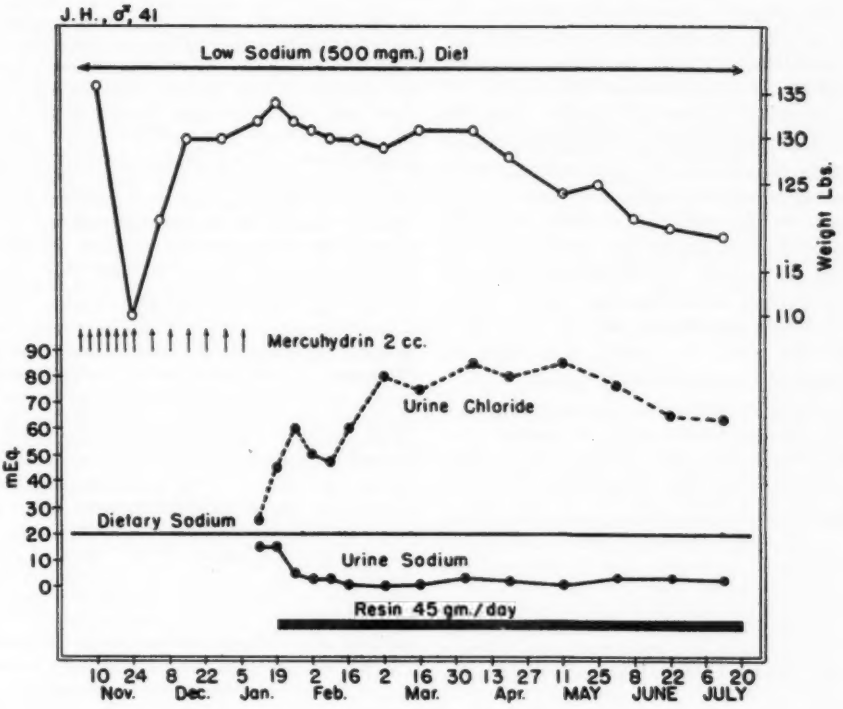
J. H., ♂, 41
Low Sodium (500 mgm.) Diet
135
130
125
115
110
Weight Lbs.
Mercuhydrin 2 cc.
90
80
70
60
50
40
30
20
10
0
mEq.
Urine Chloride
Dietary Sodium
Urine Sodium
Resin 45 gm./day
10 24 8 22 5 19 2 16 2 16 30 13 27 11 25 8 22 6 20
Nov. Dec. Jan. Feb. Mar. Apr. MAY JUNE JULY

FIG. 1

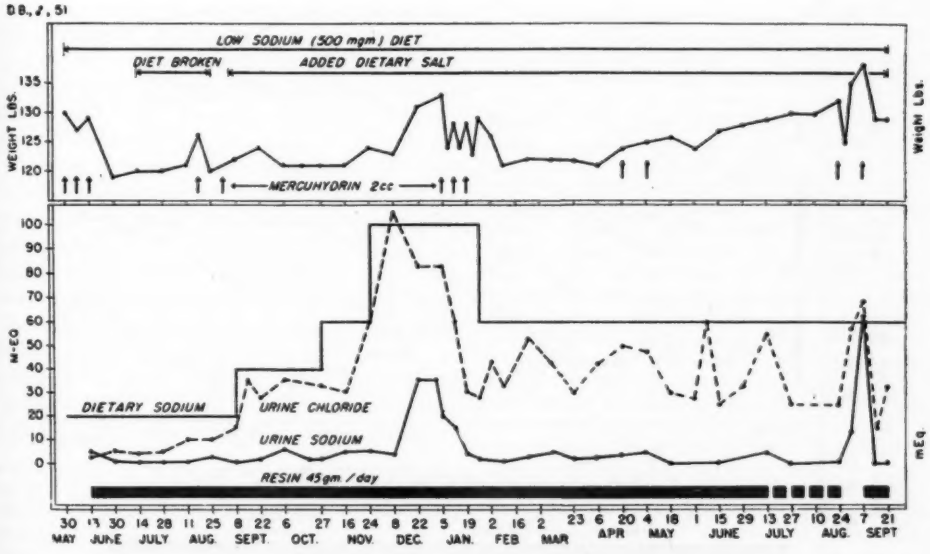
D.B., ♂, 51
LOW SODIUM (500 mgm.) DIET
DIET BROKEN
ADDED DIETARY SALT
WEIGHT LBS.
135
130
125
120
Weight Lbs.
MERCUHYDRIN 2cc
100
90
80
70
60
50
40
30
20
10
0
M-EQ
DIETARY SODIUM
URINE CHLORIDE
URINE SODIUM
RESIN 45gm./day
mEq
30 13 30 14 28 11 25 8 22 6 27 16 24 8 22 5 19 2 16 2 23 6 20 4 18 1 15 29 13 27 10 24 7 21
MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB MAR APR MAY JUNE JULY AUG. SEPT

FIG. 2

though this patient complained occasionally regarding the taste of resin, at no time was this a real problem. It was suspected, and substantiated by the rise in urine chlorides, that the patient departed further and further from his diet as clinical improvement progressed. Despite this dietary divergence, the urine sodium output remained at a very low level, and there was no subsequent weight gain due to fluid retention. Serial electrolyte determinations remained within the range of normal. It is thought that the patient's sudden death was the result of his vascular disease, and had no relation to therapy, although this cannot be proved. Unfortunately no post mortem examination was made.

Case 2.—D. B., a 58-year-old white man, has been followed in our out-patient clinic for fourteen years because of hypertensive and coronary heart disease, marked cardiac enlargement, and nephrosclerosis with moderate renal insufficiency. In 1947, at the onset of congestive heart failure, he was digitalized and was placed on a 0.5 gram sodium diet, which he followed with great difficulty under close supervision. As a result, he remained in borderline failure with recurrent episodes of frank failure, often requiring mercurial diuretics twice weekly. Following a period of hospitalization in February, 1950, the basic rice-fruit diet was given. Although improvement was noted while on this very rigid regimen, he was unable to adhere to it for long, and consequently by May, 1950, mercurial diuretics were again required two to three times weekly in order to prevent failure. As a compromise measure, a diet of approximately 0.5 gram of sodium and 40 grams of protein was allowed for a control period of four weeks before the institution of continuous cation exchange resin therapy. For the first three months on resin therapy he remained free of failure, greatly increased his activity level, and, despite frequent dietary breaks, required additional mercurial diuretics on only two occasions. During the next five months increasing amounts of sodium as dissolved tablets of sodium chloride were allowed (*Fig. 2*). With the addition of 4.8 grams (88 mEq.) of sodium chloride during a period of nine weeks, the patient rapidly gained weight and developed signs and symptoms of heart failure, again requiring mercurial diuretics. With 2.4 grams (44 mEq.) of added sodium chloride, a total intake of approximately 1.4 grams (60 mEq.) of sodium, his weight remained stable, urinary sodium output continued at low levels, and mercury was required but twice. It was observed that he was willing to adhere to his diet only when additional sodium was provided. In May, 1951, after eleven months of continuous therapy with 45 grams daily of the ammonium-potassium form of resin, the patient was given six weeks of therapy with the hydrogen-potassium form of carboxylic resin. During this period there was a gradual onset of weakness, nausea and epigastric burning for the first time since the institution of resin therapy. Electrolyte studies showed a drop in carbon dioxide combining power to 23 volumes per cent with lowered serum potassium and moderately elevated serum chloride. With return to the ammonium-potassium form of resin, the electrolyte pattern returned to normal (*Fig. 3*), and untoward symptoms disappeared.

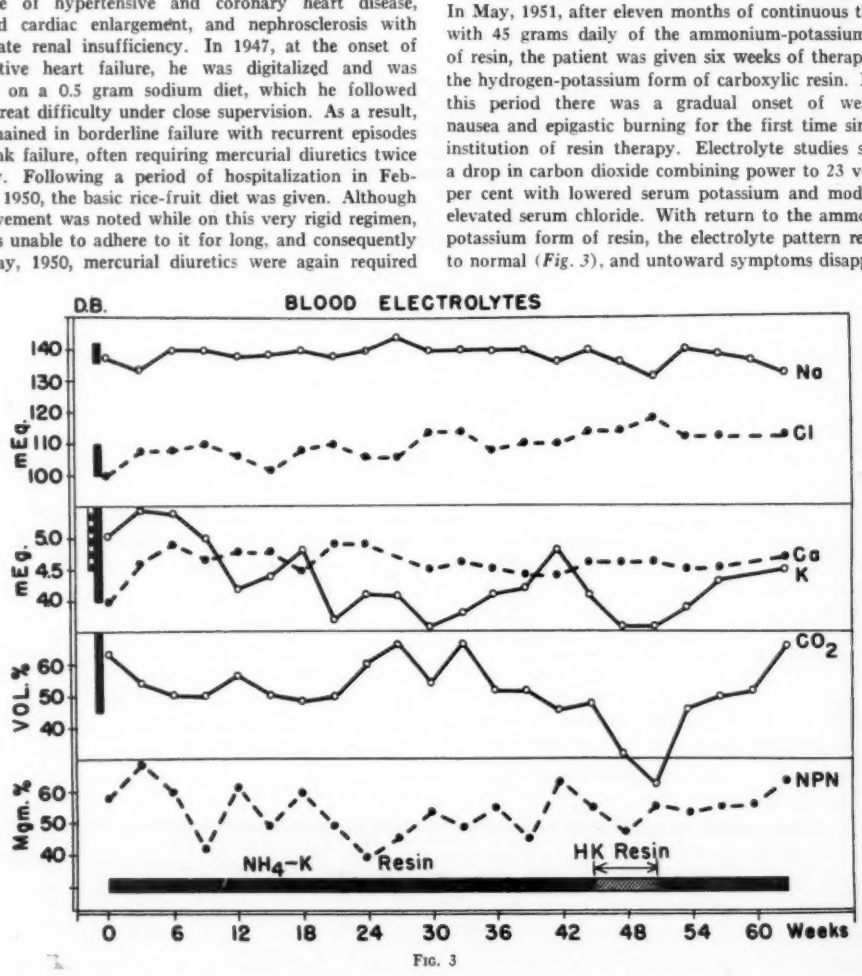

FIG. 3

In a six-week period during which resin was given intermittently two days out of three, the patient gradually gained weight and became more dyspneic with exertion. During a two-week control period with no resin, there was a rapid weight gain and development of early signs of congestive failure. These disappeared with the resumption of resin therapy.

This patient exemplifies several interesting points pertaining to the use of exchange resin. Heart failure, which had incapacitated him and required the frequent use of mercurial diuretics, became compensated with continuous resin therapy, both during the use of a diet low in sodium (0.5 gram) and with a more liberal (1.4 gram) sodium intake. It is known that the patient adhered to strict diets intermittently because of lapses in will power, this despite the knowledge that heart failure would ensue. When added salt (as dissolved sodium chloride tablets) was allowed during resin therapy, this patient, for the first time in his life, actually was willing to adhere to a low sodium diet. It was found that the patient could ingest approximately 1.4 grams (60 mEq.) of sodium with little weight gain while taking 45 grams of resin daily. On the basis of urine sodium and chloride excretion studies we estimated that between 1.0 and 1.5 mEq. of sodium were removed per gram of resin in this patient. Substitution of the hydrogen-potassium form of resin for the ammonium-potassium form during a six-week period resulted in marked electrolyte disturbance and gastrointestinal irritability. Intermittent resin therapy, two days on and one off, was not so effective in preventing edema formation as was continuous daily therapy. During a control period without resin the patient became decompensated, but with resumption of resin therapy was again compensated. It should be noted that during fifteen months of ammonium-potassium resin administration there were no persistent electrolyte abnormalities. At times serum sodium and potassium were slightly below the normal range and the carbon dioxide combining power was intermittently lowered, as would be expected. Serum calcium and chloride remained within normal limits and the initially elevated nonprotein nitrogen remained stable.

Case 3.—H. F., a 71-year-old white man, has been known for twenty-three years to have rheumatic heart disease with mitral stenosis and insufficiency and aortic stenosis. He had noted gradually decreasing exercise tolerance for ten years, and four years before, in 1947, was digitalized for the first time when auricular fibrillation appeared. Four months afterward hospitalization was necessary because of congestive heart failure; compensation was accomplished for several months by the use of dietary sodium restriction, digitalis, and limitation of activity. Recurrent episodes of mild failure occurred in January, 1949, and December, 1950. The patient was allowed a diet containing approximately 1.0 gram (44 mEq.) of sodium daily, and was given mercurial diuretics at weekly intervals. In January, 1951, cation exchange resin therapy was begun. During the subsequent seven months of continuous therapy his weight remained stable, no further mercurial diuretics were required, and his exercise tolerance was markedly improved. During a two and one-half week control period without resin he rapidly gained weight and developed early signs of failure for the first time in seven months (*Fig. 4*). His weight returned to normal when resin therapy was resumed.

This patient demonstrated remarkable clinical improvement by the addition of cation exchange resin to previously instituted therapeutic measures. There was no objection to the taste of resin, although it was found to be somewhat constipating. Note the rapid drop in weight due to loss of edema fluid without the use of mercury during the first three weeks of resin therapy (*Fig. 4*). No untoward effects other than constipation were experienced by this patient. Serum electrolyte determinations made following each visit were consistently within normal limits.

Case 4.—M. C., a 46-year-old white woman, had rheumatic heart disease, with gradually increasing exertional dyspnea over a period of six years. Since 1947 she had been seen at frequent intervals in our cardiac clinic because of repeated episodes of congestive heart failure. Hospitalization was necessary on two occasions and, despite strict adherence to a diet low in sodium (0.2 to 0.5 gram), mercurial diuretics were required every one to two weeks. Attempts to revert her auricular fibrillation were unsuccessful. During the eight months before beginning cation exchange resin therapy there were several episodes of moderately severe failure; mercurial diuretics were required twice weekly. In September, 1950, resin therapy was added as a supplement to the strict dietary sodium restriction, rest, and digitalis therapy. During the first three months of this regimen only one injection of a mercurial diuretic was needed; she remained free of failure, and her exercise tolerance was moderately improved. Because of this improvement, the dietary sodium allotment was increased by 0.5 gram (22 mEq.) to a total of 1.0 gram (44 mEq.). During the next three months mercury was administered on three occasions because of decreased exercise tolerance and gradual edema formation. Resin therapy was discontinued during a control period of three weeks. Within two weeks there was a gain in weight of twenty pounds and marked increase in exertional dyspnea, moist rales at the lung bases, and pitting ankle edema. With the resumption of resin therapy at an increased level to 60 grams daily, signs and symptoms of decompensation disappeared and no further mercurials were required. During two weeks on the hydrogen-

potassium form of resin, abdominal pain, anorexia, nausea, and vomiting were experienced. The patient was admitted to the hospital with clinical acidosis and hypokalemia, which were corrected by appropriate measures (*Fig. 5*).

This patient received eight months of continuous cation exchange resin therapy except for a three-week control period. She previously had experienced increasingly severe bouts of congestive heart failure over a period of six years despite adequate digitalization, faithful adherence to a strict low sodium diet, and the frequent use of mercurial diuretics. Continuous exchange resin therapy as an adjunct to the above measures permitted a marked increase in her activity level, kept her relatively free of edema for a period of eight months, and allowed the addition of a small amount of sodium chloride (1.2 grams) to her diet. It is of interest to note that this patient's excretion of sodium in the urine seldom rose above 0.5 mEq. (12 mg.) in twenty-four hours, even while she was gradually accumulating edema fluid (*Fig. 6*). Note the intermittently low serum sodium and the slightly lowered serum calcium, despite supplementary dietary calcium. It was thought that the severe electrolyte disturbance noted during the brief trial on the hydrogen-potassium form of resin was initiated by an attack of gallbladder colic, to which the patient was occasionally subject. She had continued to take the resin without ingesting any food in spite of warning against this.

Case 5.—P. C., a 68-year-old white man, has hypertensive and rheumatic heart disease and mild renal insufficiency. Following an initial episode of frank congestive heart failure in 1945, this patient remained fairly well compensated for four years as the result of careful management, including a program of rest, digitalization and dietary sodium restriction. Despite what was thought to be careful adherence to this regimen, hospitalization was necessary because of severe failure in 1947, and in 1948. During the month following his last period of hospitalization there was a gain in weight of twenty-two pounds. For the next four months he required mercurial diuretics frequently and his activity was severely restricted. In May, 1950, daily cation exchange resin therapy was begun as a supplemental measure. Forty-five grams were given daily for the next sixteen months, during which period he remained free of failure, increased his activity level markedly, and required no mercurial or other diuretics. During a control period of eight weeks without resin, despite continuation of dietary sodium restriction and digitalization, he gained twenty pounds, and developed pitting ankle edema, engorged neck veins in the upright position, and moist rales at the lung bases. These signs subsided with resumption of resin therapy. Added sodium as tablets of sodium chloride was given for a short period but was discontinued because of anxiety on the part of the patient. During a two-month period resin was given intermittently, two days on and one day off, with resultant gradual gain of six pounds in weight but no appreciable impairment in exercise tolerance (*Fig. 7*).

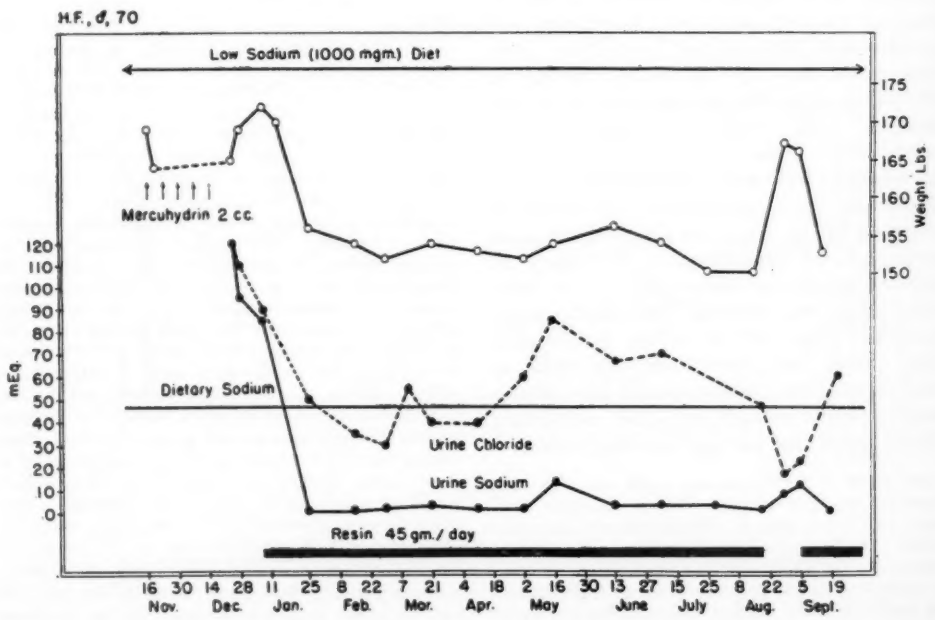

FIG. 4

This is an example of a patient who, despite careful management and faithful adherence to a low sodium dietary regimen (0.5 gram or less daily), nevertheless was in extremely poor clinical condition in May, 1950, when resin therapy was begun as a supplementary measure. During an eighteen-month period of resin therapy he was markedly improved, became active in work about the house, gardening, and in the care of his livestock. Mercurial diuretics, previously required at weekly intervals, were not employed at all during resin therapy. This patient had no complaints regarding the taste or manner of taking resin. During therapy with the ammonium-potassium form there were no subjective ill effects, no clinical acidosis, and no more than temporary disturbance of the chloride-carbon dioxide combining power ratio, in spite of the existence of mild renal insufficiency (nonprotein nitrogen 45-65 mg. per cent). During six weeks of therapy with the hydrogen-potassium form of resin there was a marked drop in serum potassium and carbon dioxide combining power, and a rise in nonprotein nitrogen and serum chloride.

Case 6.—B. C., a 58-year-old white man, was hypertensive and has arteriosclerotic heart disease, with marked cardiac enlargement and a history of chronic congestive heart failure of five years' duration. Since the onset of dyspnea and edema in 1945 this patient has received digitalis daily and has been instructed repeatedly in the use of diets low in sodium, to which he has adhered only sporadically. Mercurial diuretics have been employed frequently during five years of cardiac decompensation. While effective at first, the mercurials more recently have led to muscular cramps and less effective diuresis. Hospitalization was necessary in 1947, 1949, and in early 1951 because of acute episodes of failure. Except toward the end of each period of hospitalization, the patient had not been completely free of edema for four years. Before the addition of resin to his therapeutic regimen in April, 1951, mercurials were given weekly despite poor diuretic response and muscular cramping. The ammonium-potassium form of resin was given daily for six months during which period the patient lost no weight except following the use of mercury, and continued to have edema, somewhat less marked, and exertional dyspnea. Mercurial diuretics were given less often but were still required at frequent intervals.

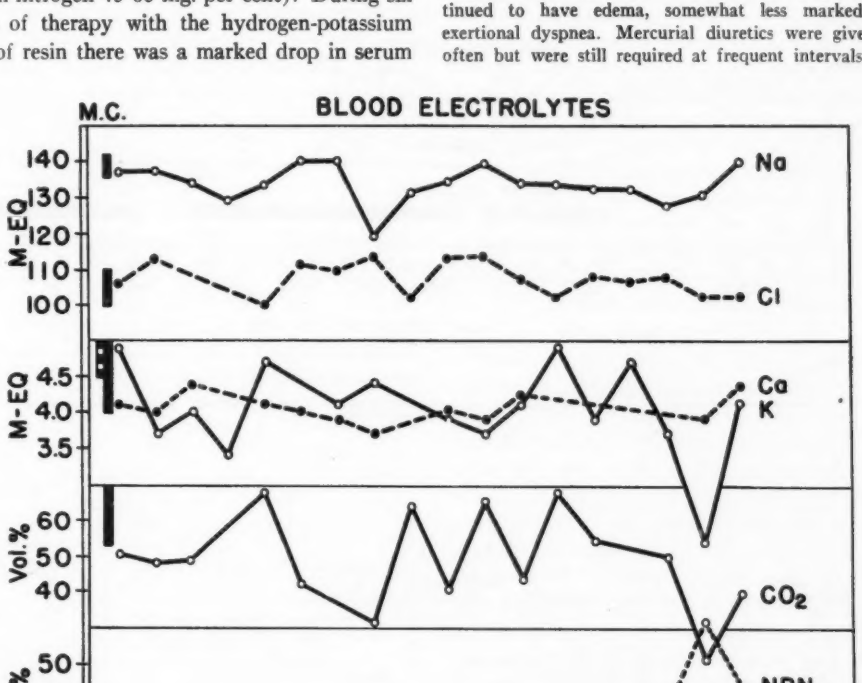

FIG. 5

Although this patient apparently did not benefit appreciably by the addition of exchange resin to his therapeutic regimen, a more rapid gain in weight followed its discontinuance. Therapy was particularly indicated in his case because of the poor response to mercurial diuretics. The failure of resin to relieve this patient of edema was thought probably to be due to his inability to restrict dietary sodium within the range in which resin might be effective. Some potentiation of the effect of mercurial diuretics was noted while resin was being given.

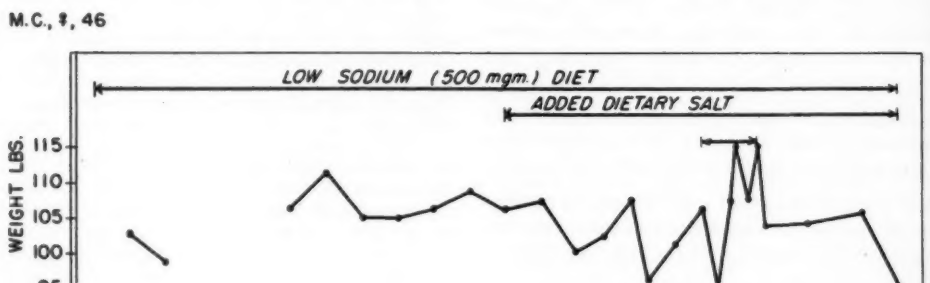

FIG. 6

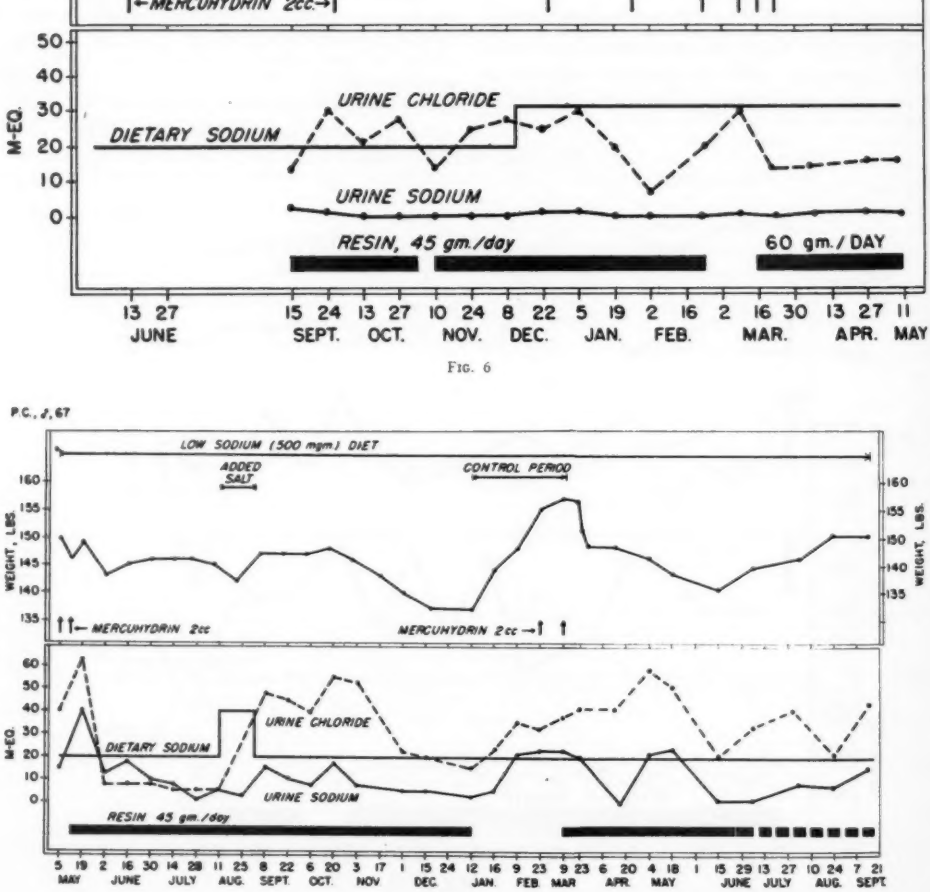

FIG. 7

Case 7.—S. I., a 56-year-old white woman, has coronary heart disease with old myocardial infarction. Following the onset of congestive heart failure two years before, in 1949, compensation was temporarily afforded by digitalization. However, in May, 1950, seventeen months previously, hospitalization was necessary because of an acute episode of failure. She improved on a regimen of rest, full digitalization, rigid dietary sodium restriction and mercurial diuretics. After returning to work, moderate dyspnea and edema again returned. In October of 1950, twelve months earlier, a more liberal diet was allowed, as a result of which mercurial diuretics were required weekly. Acute congestive failure with marked edema, pulmonary congestion, and marked liver enlargement again necessitated hospitalization in January, 1951. During this hospital stay she lost thirty pounds in weight with the aid of rest and mercurial diuretics. Cation exchange resin therapy was then added to the regimen of strict dietary sodium restriction and digitalization. During six months of continuous resin therapy there was no return of dyspnea, edema, or of other signs or symptoms of heart failure. There were no untoward effects related to exchange resin therapy and no disturbances in the serum electrolyte pattern.

This patient could not be made completely free of edema by the use of digitalis and diet alone. When she departed from her restricted diet, acute failure resulted. During six months in which cation exchange resin was used to supplement previous therapy she remained free of failure and resumed full time work as the manager of a small business.

DISCUSSION

Cation exchange resins are plastics which have been synthetically prepared and powdered. Of the two principle groups of these resins, sulfonic and carboxylic, the latter has proved to be more acceptable for clinical use. These carboxylic resins are prepared by the polymerization of short-chain carboxylic acids, with resultant formation of very large molecules presenting large surface areas with available carboxylic radicals to which cations can be attached and released. *In vitro,* the order of binding of different cations depends both upon the concentration of available ions and upon valence and molecular weight, ions of higher valence or molecular weight tending to occupy the resin in preference to ions of lower valence or lower molecular weight. The resin initially may be saturated with any of several cations, hydrogen or ammonium being those commonly employed. Because of the removal of large amounts of potassium in the bowel by the same mechanism by which sodium is removed, it has been found desirable to have one third of the resin in the potassium form, so that in the acid medium of the stomach, potassium ions will be released to compensate for potassium removed by the resin in the intestinal tract. The exchange resin used in the patients reported in this communication has been initially saturated in this manner with both ammonium and potassium ions in a ratio of 2 to 1. By this means, 2.3 grams (60 mEq.) of potassium are supplied daily with 45 grams of resin. In exchange for ammonium and potassium ions released in the acid medium of the stomach, hydrogen ions are bound by the resin. In the alkaline medium of the small intestine, these hydrogen ions are in turn exchanged for sodium and potassium and, to a much lesser extent, other available cations, which are then removed with the resin by way of the stool.

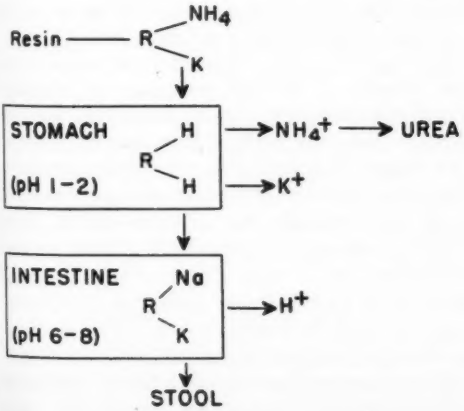

FIG. 8

There are at this writing three commercially available preparations of cation exchange resin. Each is of the carboxylic type, one being saturated initially with ammonium and potassium ions, and two being in the hydrogen-potassium cycle. One of the latter has twelve per cent by weight of an anion exchange resin added, it being thought that this would better enable the body to maintain a normal acid-base balance. Our own experience has been confined chiefly to the use of the ammonium-potassium preparations. Our use of the hydrogen-potassium form of resin in three patients presented herein resulted in electrolyte disturbances of a degree not encountered with the ammonium-potassium form, but this experience was too limited to be conclusive.

Indications for the use of cation exchange resin therapy are limited to those conditions

in which sodium would ordinarily be restricted in the patient's diet. As demonstrated by six of our seven patients, severe heart failure which has been managed with difficulty by conventional measures may be greatly improved by the additional use of exchange resin therapy. It should be emphasized that in these cases resin is an adjunct to conventional measures, and not a replacement, although by its use the need for mercurial diuretics may be eliminated and less rigid dietary sodium restriction may be required. Resin therapy has been found particularly useful in patients in whom mercurial diuretics have not been effective in promoting diuresis. We have found that there are occasional patients who, despite the knowledge of serious consequences, are not able or willing to adhere to diets rigidly restricted in sodium (*Case 2*). In our experience, these patients particularly have been benefited by the use of resin. Some patients (*Cases 4* and *5*) who faithfully adhere to strict low sodium diets, may receive added benefit from the additional sodium restriction afforded by the resin. Edema associated with cirrhosis of the liver, nephritis, pericarditis, and the premenstrual period may be treated with cation exchange resin. It has been noted by several observers and confirmed by our own observations that the ammonium form of resin potentiates the action of mercurial diuretics.

There are in general three contraindications to the use of cation exchange resins of the type under discussion. Patients with more than a mild degree of renal insufficiency are usually poor candidates for resin therapy because of the danger of uncompensated acidosis. This may result from the failure of the kidneys to maintain acid-base equilibrium by the formation of ammonia. Two patients (*Cases 2* and *5*) were known to have mild to moderately severe renal insufficiency before institution of resin therapy. Phenolsulfonphthalein dye excretion curves were poor, with total two-hour dye excretions of 26 and 45 per cent respectively. During more than one year of continuous administration of ammonium-potassium resin, nonprotein nitrogen determinations remained in the range of 50 to 65, serum chlorides remained within normal range, and carbon dioxide combining power determinations were noted to be within the range of normal to slightly below normal. This would be expected with the daily ingestion of an equivalent of 8 grams of ammonium chloride. In these two patients and one other (*Case 4*), carbon dioxide combining power determinations fell to very low levels during the administration of the hydrogen-potassium form of resin. Clinical acidosis was evidenced with this form of resin by two patients (*Cases 2* and *4*). *Case 4* illustrates a second contraindication to the administration of cation exchange resin, i.e., insufficient dietary intake. Patients not eating well should be given resin with caution, and it should be stopped immediately if for any reason, as in *Case 4*, the patient stops eating. Under such circumstances, resin binds circulating cations entering the bowel, leading to serious disturbances in electrolyte balance. A third contraindication to resin therapy is provided by patients known to exhibit the low-sodium syndrome.

It must be emphasized that the use of cation exchange resin is not without hazard. This hazard is greater with the continuous administration of resin than with its intermittent use or in single short courses. Added caution should be observed in patients who exhibit renal insufficiency and in all instances of marked dietary sodium restriction. The possible complications of acidosis, low-sodium syndrome, hypokalemia, and hypocalcemia must be constantly watched for and immediately corrected when observed. With the continuous administration of resin, particularly when diets very low in sodium are used (below 0.5 gram daily), the patient should be followed at frequent intervals, and determinations of the serum sodium, potassium and carbon dioxide combining power should be made at intervals of two to four weeks. Supplementary calcium as calcium lactate, five grams daily or as milk, sixteen ounces daily, should be given to replace the calcium which may be removed by the resin. The patient's weight should be carefully followed, and should serve as a guide to the efficacy of, and the indication for, further resin administration. It is, of course, not intended that resin replace such specific therapy for congestive heart failure as digitalis and rest. Mercurial diuretics should be used as indicated, with the knowledge that diuretics will be more effective during or immediately following the administration of resin. Dietary sodium restriction cannot be abandoned during the administration of resin to edematous patients. As with most of the patients presented in this communication, compensation may be achieved only with the concomitant use of both resin and rigid

dietary sodium restriction. Indeed, if a patient ingests sodium beyond a certain level, he merely saturates the resin and has sufficient excess sodium to continue to form edema. *Case 6* is presented as an example. Although the resins available for general use will adsorb *in vitro* as much as 10 mEq. (23 to 46 mg. of sodium) per gram, only 1 to 2 mEq. per gram are adsorbed *in vivo*. The amount of sodium bound varies with the concentration of sodium and other cations in the bowel. Our observations indicate that patients eating diets containing 3.0 to 4.0 grams of sodium (7 to 10 grams of salt) may have as much as 46 mg. (2 mEq.) of sodium removed per gram of resin. Diets containing 2.0 grams (88 mEq.) of sodium may have half of this amount removed by the standard daily dose of 45 grams of resin, that is, about one mEq. per gram of resin. Moderately restricted diets containing 1.0 gram (44 mEq.) of sodium may have 75 per cent (0.75 gram or 33 mEq.) of this removed in a day by 45 grams of resin. With more rigid dietary sodium restriction (0.5 gram or 22 mEq.), 80 per cent or more (0.4 gram or 20 mEq.) of the sodium may be removed in one day by resin, about one-half mEq. per gram of resin.

Resin is usually given with meals, in doses of 15 grams three times daily, as it is more conveniently taken at this time. Supplementary calcium and vitamins are given between meals. Although some of our patients have objected to the taste of resin in earlier forms, more recent preparations have proven more palatable. In general, patients sick enough to need this form of therapy have not objected seriously to the taste or bulkiness of the preparation. The powdered resin may be mixed with cold fruit juice, water or milk, or may be mixed with a solid food such as cereal or mashed potatoes. Most of our patients have required mild laxatives to overcome the tendency to constipation caused by the bulk and consistency of the resin in the lower bowel. Fecal impaction has not been encountered but must be watched for alertly. Gastrointestinal irritation has not been a serious problem with the ammonium-potassium form of resin.

SUMMARY AND CONCLUSIONS

(1) Seven patients with long standing severe congestive heart failure who had responded poorly to conventional methods of treatment, including dietary sodium restriction, have been studied during the continuous administration of cation exchange resin, for periods of from six to fourteen months. Various problems pertaining to the use of cation exchange resins as exemplified by these patients are discussed.

(2) Frequent determinations were made of serum and urine electrolyte concentrations. Extremely low twenty-four hour urine sodium excretion levels were noted. Serious serum electrolyte disturbances were not encountered during the administration of resin in its ammonium-potassium form.

(3) Six of the seven patients were definitely improved while taking resin, as evidenced by stability of weight, failure to develop edema, improved exercise tolerance, and lowered requirement of mercurial diuretics.

(4) The indications, contraindications, and hazards of cation exchange resin therapy are discussed.

(5) It is concluded that the prolonged continuous, as well as the intermittent, use of cation exchange resin is a useful adjunct to the conventional therapy of congestive heart failure, and of other edematous states associated with the retention of sodium.

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DISCUSSION (*Abstract*)

Dr. Howard L. Holley, Birmingham, Ala.—Drs. Voyles and Orgain's results are impressive, making the plausibility of the use of these resins much more reasonable. In the future I am sure we shall find them widely used as supplementary measures in the control of symptoms of congestive failure. They have added their experiences to other workers in evaluating the use of cation exchange resins in the therapy of congestive heart failure.

Their recommendation for addition of calcium to the diet of these patients is well founded inasmuch as it is known that these resins have a greater affinity for calcium and magnesium than for potassium and sodium. Therefore, the time of administration of the supplemental calcium is important. It seems reasonable to assume that if this cation is given along with the resins, the substance will take up the calcium in preference to sodium. Hence, if enough calcium ion were given, along with the resin, it would completely nullify the desired effects. Therefore, the authors' recommendation that calcium be given between meals is a valuable one.

I believe that the authors' estimation of the efficacy of one gram of resin in removing between 1 and 1.5 mEq. of sodium from the diet is excessive. Danowski has recently shown conclusively that resins remove at best no more than 1 mEq. of sodium per gram of resin, and frequently much less.

The findings of the authors that efficacy of resins in removal of sodium is much more reliably arrived at by stool studies in contradistinction to measuring the output of sodium in the urine needs re-emphasizing. Both the hydrogen and ammonium ion form of the resin produce a metabolic acidosis with an elevated serum chloride and a low bicarbonate. This acidosis enhances the urine volume without a marked increase in sodium excretion. Therefore, determination of the urine sodium in these cases may be misleading in estimation of efficacy of the resin.

It is of interest to note that in the authors' experience the hydrogen ion form of the resin gave much more electrolyte imbalance. We have not noted any significant difference between the hydrogen and ammonium ion forms as far as acid-base balance is concerned. They both may produce a very profound acidosis.

A very good observation made by these workers is the potentiation of the action of mercurial diuretics by resins. These resins give rise to acidosis with resultant increase in urine flow with little or no increase in sodium excretion. This type of synergism has been shown previously with the use of ammonium chloride. I believe that Greenman and his co-workers have postulated this synergism between resins and mercurial diuretics, but a confirmation of this finding has not been reported prior to Drs. Voyles and Orgain's paper.

The development of potassium deficit is of interest therapeutically, inasmuch as these resins may be used in patients exhibiting excessive potassium retention. In patients given resins, the potassium excretion in stools, per gram of resin, is usually about 50 per cent greater than that of sodium.

Perhaps in order to prevent the hypokalemia in patients treated with resins, the addition of potassium chloride or potassium bicarbonate in fruit juices between meals would be useful. This would seem preferable to the addition of potassium ion cycle resin, inasmuch as the addition of the potassium salt would serve to make more resins available to remove the sodium, and also, a more accurate adjustment of potassium imbalance.

In conclusion, I would like to say again that the authors have presented excellent evidences of the value of resins in long periods of treatment for congestive heart failure. They have in addition suggested definite treatment regimens that have been in need of standardization for a long time. Of immense value to the physician is the observation that adequate control of dosages can be determined by the patient's weight changes. It is even plausible that the patient may be able to perform this duty himself and adjust his dosage of resin accordingly.

It might be pertinent to this discussion to re-emphasize the indications, contraindications, and side effects of the resins in therapy of congestive failure.

Resins should be used in patients in whom mercurial diuretics have not been effective; in patients not willing or able to adhere to rigidly restricted diets; and in patients in whom mercurial diuretics cannot be administered for one reason or another.

Contraindications are renal insufficiency; insufficient dietary intake; and known low sodium syndromes.

Side effects may be hyperchloremic, hyponatremic acidosins; hypokaliemia; hypocalcemia; and constipation.

Dr. Voyles (closing).—With regard to electrolyte disturbances encountered with use of resin in the hydrogen cycle, I should like to emphasize that our experience in this respect has been too limited to be of real significance. It may be that differences in moisture content or in amounts of potassium released by the two forms would account for some of the variability in action. It is true that constipation has been a frequent problem, but we have been able to manage this by judicious use of laxatives and careful instruction regarding bowel habits. Diarrhea and excessive salivation have not been encountered in this group of patients. It is hoped that more palatable, less bulky, and even more effective preparations will be made available.

LYMPHOBLASTOMATOSIS*

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The tumor form under discussion may occur in any part of the lymphatic system. It is composed of lymphocytes or more generally of their ancestral element lymphoblastoma and has appeared in the literature under various names: lymphosarcoma, lymphocytoma, round cell sarcoma, intestinal Hodgkin's, granulomatous pseudo-leukemia, chronic inflammatory tumor, and lymphoid granulation tumor.

Pathologists[1] reserve the term sarcoma for neoplasms of supporting tissue, and lymphoblastoma has been suggested as a substitute. Metastases follow the lymph channels at first, and finally invade the surrounding structures until fused into one firm mass. Lymphosarcoma or the small round cell sarcoma is highly malignant. It has its origin in lymphoid tissue and according to Ewing, results from proliferation of atypical lymphocytes.

The case to be presented is an elderly woman 80 years old, fairly well nourished and with no immediate objective symptoms except painless bleeding from the rectum for the previous week, and ribbon type stools at times for the preceding two months. In the previous six months a lump had been noticed in the right breast near the axillary area, which doubled in size in the previous three months, and at the time of examination was equal in size to a walnut.

The past history in the preceding year was negative except for pulmonary symptoms. The patient had treatment for sinusitis, asthma, and bronchial conditions. Roentgenologic studies of the chest in the early spring of 1948 were negative. Rectal suppositories had been administered for the previous few months for the asthmatic condition, and when bleeding occurred, a digital examination revealed a rectal mass, which was semi-solid and fixed diffusely in the left lateral wall of the rectum, about 10 cm. proximal to the anus. It seemed to infiltrate the valve of Houston which was very much indurated. Proctoscopic examination was confusing because of the edematous inflamed mucosa and a diffuse oozing of fresh blood from the mucosa which showed no definite necrosis or isolated areas of ulceration or break in its normal continuity. A biopsy was taken deeply into the area of the valve of Houston, and the pathologic diagnosis was malignant lymphoblastoma of the rectum. Laboratory studies showed that the hemoglobin, red cell count and color index were normal. The differential was normal except for eosinophilia. The white count was 7,500, with polymorphonuclears 75, basophils 2, lymphocytes 24, and nuclear index 31. Serum protein was normal.

*Read in Section on Proctology, Southern Medical Association, Forty-Fifth Annual Meeting, Dallas, Texas, November 5-8, 1951.

The patient was hospitalized for further study of the rectal tumor and the lump in the right breast. Biopsy of the rectal tumor revealed lymphocyte lymphosarcoma of the rectum and the same tissue was found also in the breast. Deep x-ray therapy was started in June, 1948, and within three weeks the pulmonary symptoms had disappeared completely and re-examination of the rectum in October, 1948, revealed normal findings.

This condition is very uncommon in the rectum and also in the colon and originates from the submucosal lymphoid tissue of the bowel wall and increases in size to considerable degree before ulceration of the overlying mucous membrane occurs.

Hayden[2] has seen just two cases and each had different physical characteristics. In one the rectal mucosa was thrown up in heavy edematous rugae due to the diffuse underlying infiltration of the tumor, and in the other there was a smooth fusiform submucous tumor in the hollow of the sacrum.

Sensitivity of these tumors to radiation is well known and radiation should be used if surgery is definitely decided upon.

In 1919 Graves extended this compilation to 249 cases and the confusion of the nomenclature in connection with these round cell tumors caused him to plead that they all be called lymphoblastoma which means

"a tumor of mesenchymal origin of which the cells tend to differentiate into lymphocytes, that is, into cells of the lymphocyte series."

In October, 1925, J. Heng Liu[3] concluded of the lymphoblastomata, that these tumors may occur at any age but a large proportion, 40 per cent, are in children under 10 years of age. The tumor may be annular, polypoid, or fungoid and the form of growth has no relationship to the malignancy of the tumor. The tumor may also be benign or malignant and there is no possible way to tell whether a tumor of this nature will recur or not, even with careful microscopic sectional studies.

His paper was based on nine cases of submucous lymphoid cell tumors of the small intestine and three of the colon which were diagnosed in the surgical pathologic laboratory of the Johns Hopkins Hospital. Of the three cases in the colon, two were in the cecum close to the ileocecal valve and the other one in the sigmoid. The blood picture was of secondary anemia of mild degree.

The sigmoid case was a man 53 years old with obstinate constipation for several months due to a mass in the sigmoid. Otherwise the findings were negative.

After a resection was performed, the gross specimen consisted of a piece of large intestine with a thick wall which felt stony and hard. Section showed dense fibrous tissue, rather pearly in appearance. Microscopically there were round cells of the lymphoid type growing in the connective tissue stroma and infiltrating the submucosa and muscular layer. The mucosa was intact. The diagnosis was chronic inflammatory tumor and the patient was well at the end of a five-year period.

CONCLUSION

Pathologists have called these tumors lymphoblastomata. They can be classified as benign or malignant in nature. The objective findings are few and vague and there is no relationship to leukemia because all blood pictures are normal except for the anemia probably secondary to undetected chronic bleeding from the intact mucosa. Deep x-ray therapy should be used even if surgery is not contemplated.

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DISCUSSION (*Abstract*)

Dr. A. M. Phillips, Macon, Ga.—The terminology used in the classification of these tumors is a bit confusing. Various terms are used, lymphoblastoma, lymphosarcoma, lymphocytoma, lymphoma, and so on. They are all generally classified as lymphosarcoma and the other terms used may or may not be correct since there is a wide variation as to the malignancy of the condition. As a rule the condition is of very low grade malignancy yet the eventual outcome is that of any other malignant tumor. The average length of life of an individual with lymphosarcoma or lymphoblastoma is five or six years. One or two cases have been reported where the patient lived 16 years after diagnosis was made. Spread is by way of the lymphatics and the process is more one of invasion than of metastasis. The condition is very responsive to x-ray therapy and cure can be expected with complete surgical extirpation. At one time it was thought that there was a possible connection between leukemic conditions and lymphoblastoma. This has proved to be erroneous. Also Hodgkin's disease was thought to be, in some way, possibly related to this condition. No proof of this has been demonstrated.

The following is a brief resume of a case of my own. The chief complaint of a white girl, age 12 years, was of rectal bleeding and slight protrusion. Bleeding was first noted six months previously, had been intermittent and with no pain. Rectal examination revealed three rectal polyps located at five, seven, and eleven o'clock. Routine laboratory work was essentially normal except for a faint trace of albumin. At operation three polyps were removed. The largest was the size of a small lima bean, with a broad base. The other two were the size of a pea. Both of these were on a short pedicle. All three were excised making a wide eliptical excision at the base. The mucosa was closed with No. 0 plain catgut.

The pathological report was lymphoblastoma (giant follicular type). Two years after removal the patient was well and in good health. There was no evidence of recurrence. Unfortunately the patient moved from Macon in 1949 and no further information as to her present condition is available.

EPIDEMIOLOGIC ASPECTS OF ATOMIC AND BACTERIOLOGIC WARFARE*

By KIRK T. MOSLEY, M.D.†
Norman, Oklahoma

There has been a definite evolution in the pattern of warfare. More and more the issue of a military conflict is being settled by carrying the acts of war from the front line to the home front. With this evolution has come the development of better and more effective weapons to be used against the supporting civilian populations. The atomic bomb and bacteriologic warfare have great potentialities in wreaking great destruction among the so-called noncombatant populations. Since this type of warfare is considered to be a real threat in the event of another major conflict, consideration has to be given to the measures which will be of value in combating the effectiveness of warfare waged in this manner. The principles which will be considered in this presentation are those dealing with the establishment of diseases and epidemics in man either by the willful use of pathogenic agents or by atomic bombing whereby conditions conducive to epidemic outbreaks are an inevitable aftermath. This discussion will not include other aspects of biologic warfare such as destruction of domestic animals or crops by pathogenic agents or poisons.

The potentialities of pathogenic microorganisms in warfare has been appreciated for

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years.[1] No human conqueror has been able to subdue the world in so complete a fashion as the small plague bacillus or the vibrio of cholera has done on repeated occasions. Other pathogens which have produced ravages of catastrophic proportions are the agents causing yellow fever, malaria, influenza and typhus fever. Many of the major military conflicts have been decided not by the number of troops, weapons, or the strategy of commanders, but by microscopic organisms which brought about more destruction than any military campaign could ever hope to achieve. The only thing really new about bacteriologic warfare is that man, through his knowledge in the realm of biology, is able deliberately to initiate outbreaks of epidemics as a planned military operation. Previously, epidemic diseases were so much a part of military conflicts that it was unnecessary to initiate them willfully. It was always a question as to which side would suffer more seriously from outbreaks of contagious diseases.

The use of bacterial agents as a war weapon will be based upon established facts concerning the cause and modes of spread of infectious diseases, namely, a bacterial agent (or its toxin) of sufficient virulence will have to enter the body in such a fashion and under such conditions so as to produce a disease. According to information available,[2] there is not much danger that a new and super virulent organism will be developed for use in bacteriologic warfare. Any agent that might be used will be one about which there is already vast knowledge concerning its abilities and potentialities for causing disease or death. The characteristics of pathogenic organisms including their pathogenicity, stability, frequency of inapparent infection with subsequent immunization, natural reservoirs, resistance to heat, drying, and chemicals are all of epidemiologic significance. For example, it is unlikely that such organisms as the streptococcus or pneumococcus or the diphtheria bacillus would be selected for use in an attack against the United States for the simple reason that a large proportion of the population has established an immunity to these organisms, either through contact with them or by means of artificially produced immunity. The unreliability of the results from the use of such agents make their use unlikely. The purpose of bacteriological warfare would be better served by the selection of a highly virulent organism, and one with which the population to be attacked has had very little or any contact so there will be very little likelihood of any appreciable immunity among the population to the chosen agent. Among the several organisms which might fit this category in an attack on the United States are the causative agents of plague, tularemia, yellow fever, psittacosis, though other technical details may preclude the use of any or all of these particular ones.

The selection of an agent for bacteriologic warfare will be governed by the method to be used in dispersing it in a community or among a group. This is because the potentiality of a pathogenic agent to give rise to an epidemic is dependent upon the route by which it reaches and enters the susceptible host. Recognition of this principle has resulted in classifying diseases for epidemiologic purposes into categories according to the usual method of spread in nature: those spread by the respiratory route, by the gastrointestinal route, by person to person contact, and by insects. Only a few communicable diseases fail to fit into one of these categories.

The ability of some diseases to spread rapidly through a community makes bacteriologic warfare intriguing. The possibility of setting up a biologic chain reaction simply by giving rise to a few initial cases through bacteriologic warfare magnifies its importance as a weapon of war. Diseases spread by the respiratory route would be expected to receive first consideration in any attempt to produce a self-perpetuating epidemic of any magnitude. However, most health authorities believe that with our present knowledge and facilities, a bacteriologic warfare attack which relies on the ability of the disease to spread unchecked throughout any extensive area will be unsuccessful.

Success of a limited but of highly strategic nature might possibly be readily obtained by introducing bacteria spread through the respiratory route into a ventilating system of a building containing the offices of key personnel. It has been shown that the air may become contaminated with germ-laden droplet nuclei and dust particles containing pathogens which are capable of remaining suspended for several hours. These small particles and nuclei may become widely distributed by air currents and produce diseases over a much larger area and for a much longer period of time than believed to be possible a few years ago. The extensive use of air conditioning units, particularly in those installations housing

key personnel, offers an excellent opportunity for the execution of bacteriologic warfare based upon these principles.

Another development of a more technical nature which has recently been stressed by Langmuir[2] concerns the use of air as a distributing medium for organisms which ordinarily use another route other than the respiratory tract to gain entrance into the body. For example, pathogens as the yellow fever virus, the typhus fever rickettsia and the tularemia bacillus which in nature usually invade the body by means of insects or other breaks in the skin are apparently able to accomplish the invasion of the body through the respiratory tract under the proper circumstances and conditions. Among the technical problems to be overcome, are those of producing a spray of these organisms so fine that they will not be filtered out by the usual mechanisms which protect the lung tissue from such agents. According to some evidence, if the spray can be made fine enough and yet of such density that a sufficient number of the etiologic agents are brought in direct contact with the lung tissues, they are taken directly into the body through the lungs and the consequences are similar to those of injecting a dose of these organisms directly into the body. Awareness of the possibility of transmitting pathogens through routes not ordinarily followed in nature should prevent confusion among medical and public health authorities should outbreaks of diseases occur under circumstances which do not follow the usual epidemiologic pattern.

There remains the possibility of mass infection of a population by means of dispersing clouds of organisms infectious through the respiratory route from aircraft or by exploding shells or bombs. Present available knowledge about microorganisms would cause one to believe that more reliable results might be obtained by using some other lethal agent such as a poisonous gas. However, since the use of gases is outlawed, the possibility of mass infection by exploding missiles or aircraft dispersing organisms must be considered especially for those pathogens which have not strict requirements for survival and retention of their pathogenicity. Many pathogens which pass through a spore stage such as the anthrax bacillus and the fungi have qualities of resistance which might make them suitable for dispersal by this unorthodox method. Also, consideration must be given to the mass aerial dispersion of toxic products of pathogens such as the toxin produced by the *Clostridium botulinum*. Since a minute dose of this toxin is fatal, a small amount could be dispersed over large areas with hopes of having a fatal dose reach a large number of persons.

It is relatively easy to understand the epidemiologic aspects of bacteriologic warfare which take advantage of the gastrointestinal route of infection. We are all familiar with large outbreaks where some common vehicle, such as food or water, carried the disease-producing agent to groups of people. The epidemiologic principles involved are well established and have been well demonstrated and recorded on numerous occasions. A saboteur might be able to cause a great deal of dislocation of an important industrial plant by deliberately contaminating some common article of food with the proper organism. Even here, there are many technical details that have to be considered. One, for example, is that the agent or the toxin must be added to the food after it is cooked, since the temperature required for most cooking purposes will destroy most pathogens and their toxins. The saboteur who uses food as a medium would be restricted somewhat in the extensiveness of the damage which he could hope to inflict. It is not likely he could gain access to a food supply that would be consumed by all the people in a city. He might disrupt the production of some strategetic war material plant by contaminating the food sources of the workers concerned and in those places where there are cafeterias which serve most of the workers, this is a distinct possibility.

Contaminating a water supply system offers potentialities of striking a larger group than could ordinarily be reached through food. The injection of large quantities of a virulent culture of an appropriate pathogenic agent such as one of the typhoid or dysentery groups of organisms into a water distributing system is said to be a fairly simple engineering feat.

Insect-borne diseases would probably not be a first choice as a weapon in bacteriologic warfare, but such diseases might well become a serious problem in areas suffering from atomic or mass bombing attacks. Under such circumstances, the routine sanitary measures exercised by individual families as well as those ordinarily performed on a community basis which have effectively controlled insect-borne diseases in

this country will be seriously impaired if not completely disrupted. Under these conditions, vectors of many of the serious insect-borne diseases which are indigenous to this country, particularly in the Southern section of the United States, might be able to establish widespread epidemics from a small reservoir of infection which might be introduced into the country either by deliberate action of the enemy or by a breakdown in quarantine regulations or by some other circumstances resulting from the military situation. However, unless there is a complete breakdown in civilian health activities, threats of widespread and uncontrolled epidemics of insect-borne diseases should not become a serious problem even in all out war. The epidemiologic pattern of insect-borne diseases, while not completely understood for all diseases, is sufficiently well worked out for those with epidemic potentialities so that any outbreaks which might occur are subject to control by application of well established and proven measures.

Diseases spread by person to person contact, such as the venereal diseases and certain of the skin diseases are not likely to be used in bacteriologic warfare. However, under conditions resulting from atomic or mass bombings, such diseases would become important health problems to civilian communities. Effective control measures are known for most of these and thus control can be expected where medical and public health facilities are in operation.

Much of the previous discussion has dealt with more or less exclusively epidemiologic aspects of bacteriologic warfare, that is, the deliberate and willful establishment of epidemic diseases in order to attain a military advantage or victory. Attention should also be given to one of the major problems to be faced in the field of epidemiology as a consequence of atomic warfare or mass bombing attacks, and that is the problem of prevention and control of epidemics in the so-called nonstrategic areas. Such areas will for obvious reasons become havens for refugees fleeing from the prime target areas of the country, either after or before an atomic or mass bombing attack has been made. The hurried introduction of large numbers of individuals into new localities usually leads to the establishment of the necessary circumstances for large outbreaks of disease. The refugees may or may not be immune to strains of organisms prevalent in their new location or the refugees may introduce new strains of pathogens to which the local inhabitants are susceptible. Probably of more importance is the establishment of conditions favorable for the development of serious outbreaks of those diseases with epidemic potentialities which under ordinary circumstances remain at a low smoldering endemic level. Outbreaks of diseases such as meningococcal meningitis, the pneumonias, streptococcal infections, diphtheria, the dysenteries, and food poisonings, are definite threats when there is overcrowding, overtaxing of sanitary facilities, neglect of personal hygiene, inadequacy of diet, failure to appreciate and to respect emergency sanitary regulations. Any one of these or other unhealthful situations may develop with the rapid influx of a large number of refugees into a rural or semi-rural community. Prompt and intelligent action will be needed to avoid the threat of outbreaks which may give rise to epidemics of major proportions.

Just as principles of epidemiology have to be used in order to wage bacteriologic warfare and to get the best results from atomic warfare, so is it essential to use epidemiologic methods to combat biologic warfare and lessen the potential consequences of epidemic disease outbreaks following atomic bombing.[3 4]

References will be made to only a few of the basic epidemiologic principles which have proven useful in times of peace and will no doubt be of equal value in the control of outbreaks caused by bacteriologic warfare or following atomic bombing attacks. These remarks will be recognized as nothing much more or less than ordinary field epidemiology.

First of all, knowledge of the occurrence and distribution of cases of diseases is essential. The importance of this aspect of epidemiology has been recently emphasized by the studies and recommendations made of the current reporting systems and practices by the Sub-Committee on National Morbidity Reporting of the Infectious Diseases Committee of the Association of State and Territorial Health Officers.[5] Of particular interest is the recommendation for the reporting of outbreaks or unusual occurrences of communicable diseases. The significant role of practicing physicians cannot be overemphasized in prompt discharge of their obligation to report diseases since they will be the first to have

knowledge of the presence of outbreaks in a community. Under circumstances of all out war, other methods may be necessary to keep a close check on the occurrence of diseases in a community.

Of equal importance with reporting is the establishment of a correct diagnosis of the cases of an outbreak. Unfortunately, few diseases are so characteristic in their manifestations as to be easily diagnosed in the early stages by the clinical picture. Good laboratory facilities must be available, and of equal importance is the careful collection of the appropriate specimens and their submission under proper conditions to the laboratory. More attention could be given to the training of the medical profession and public health worker in the collection and submission of laboratory specimens.

There is yet no substitute for visiting patients and obtaining epidemiologic information on individual cases in order to determine the characteristics of a particular outbreak. Without this type of information, it is most difficult to devise sound and logical measures of prevention and control. In those outbreaks where a diagnosis of cases cannot be readily established, skillfully conducted field epidemiology will often be able to disclose the pertinent circumstances responsible for the outbreak so that appropriate control measures can be instituted. Also epidemiologic information often is of valuable assistance in determining the etiologic agent responsible for the outbreak so that proper therapeutic agents can be used.

The shortage of well-trained epidemiologists, experienced in field work, is the price we are now paying for the high degree of communicable disease control this country has been enjoying in recent years. The Communicable Disease Center of the United States Public Health Service has recently undertaken to overcome this shortage of epidemiologists by establishing a program of recruiting and training a corps of these specialists.[6] An initial group of 21 medical officers have been selected for this service and given an intensive course in certain fundamentals of epidemiology. They are now on assignments to various stations through the United States and will be available for epidemic services on request.

As a final note on this subject, reference should be made to the fact that an enemy's purpose can be served just as well with only a few cases of the disease produced by bacteriologic warfare if these cases initiate panic among the civilian population. In fact, rumors of bacteriologic warfare can be as useful to an enemy as the real thing by destroying civilian morale and bringing about the disruption of the normal functions of the community, including interference with the community's contribution to the war effort. The best form of preparedness by any community against the serious and damaging effects that can be caused by rumors of bacteriologic warfare is a well established health department which has earned the complete confidence and respect of the population by sound and effective work in disease prevention and control in times of peace and a local medical society which enjoys a place of leadership in the affairs of the community. Such a health department and local medical society through a well organized information service, can keep the public fully informed of any situation which may develop with clear and simple advice about the actions to be taken by individuals for the protection of their own as well as the community's health. A fully informed public which has confidence in the ability and integrity of the health department will not be easily deceived by false reports and rumors from irresponsible sources.

There is no group so well prepared and experienced in applying on a community basis the science of the prevention and control of communicable diseases as the organized and well staffed health department, and communities with such a facility have a definite advantage for their protection in all out war in which pathogenic agents are to be used as a weapon of war or relied upon to aggravate the damage to civilian communities by atomic or mass bombing attacks.

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DEXTRAN*

A POLYSACCHARIDE FOR THE EXPANSION OF PLASMA VOLUME

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Although partially hydrolyzed dextran has been accepted clinically for a plasma substitute as a result of clinical trials by Thorsen[1] in Sweden and Bull[2] in England, this material has not been used extensively in America. Several conflicting reports of dextran reactions probably account for the caution in regard to the use of this material. Turner, *et alii*[3] reported 30 per cent reactions following intravenous injection of dextran, and Goldenberg, Crane, and Popper[4] reported pathological renal changes in dogs. In contrast, Lundy[5] reported no reactions in a large clinical series. Our interest in the problem was stimulated by studies of the changes which resulted from the intravenous injection of glycogen.[6] Both dextran and glycogen are composed of glucose molecules connected by 1-4 and 1-6 alpha-glucosidic linkages. In glycogen the glucose molecules are linked in chains at the 1-4 positions, and branching occurs at the 6 position,[7] and in dextran the chains consist of 1-6 linkages, and branching occurs at the 4 position.[8] The degree of branching in the two substances is different, so that the more branched glycogen is globular, and the less branched dextran is linear.[9]

Numerous investigators have shown that expansion of the blood volume is therapeutically indicated in shock. Therefore, it seemed essential to establish that the hydrolyzed dextran molecules would produce and maintain hemodilution and that injection of the material was not injurious or associated with reactions. Once these facts were established, the value of this substance for the expansion of blood volume would be assured.

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This report presents data on the injection of partially hydrolyzed dextran in 50 patients having a variety of diseases unassociated with shock. Clinical studies of pulse, temperature, blood pressure, venous pressure, vital capacity, and respiration are reported. Renal function (urinalysis, phenolsulfonphthalein, nonprotein nitrogen and creatinine clearance) and clinical tests usually associated with some phase of hepatic function (bromsulfalein, serum proteins, cephalin flocculation, and icterus index) have been studied in certain of these patients. Hemodilution has been studied by means of serum protein and hematocrit. The data indicate that no clinically measurable renal or hepatic impairment, as measured by the tests used in this study, results from dextran injection and that hemodilution is maintained at least six hours.

EXPERIMENTAL

This study was conducted on fifty male patients whose ages ranged from 20 to 75 years, and these patients had a variety of diseases as indicated in *Table 1*. In no instance was there reason to suspect an alteration of blood volume before dextran injection. A 6 per cent, partially hydrolyzed dextran solution† was injected into the antecubital vein. The solution at pH 6.5-7.0 had 146-152 mEq. of sodium and 1-2 mEq. of potassium per liter. Eight different preparations were used having intrinsic viscosities ranging from 2.92 to 3.8 centistokes at 25° C. The patients were on regular ward diets and pulse, respiration, and temperature were recorded at 4-hour intervals. More frequent recordings were taken in some instances. Venous pressure was

†Kindly supplied by Commercial Solvents Corporation, Terre Haute, Indiana.

DIAGNOSES OF FIFTY PATIENTS INJECTED WITH DEXTRAN

Category	No. Patients
Infection	15
Cardiovascular disease	10
Gastrointestinal disease	6
Neurological disease	3
Anxiety	5
Neoplasia	2
Arthritis	3
Miscellaneous	6

TABLE 1

recorded from the uninjected antecubital vein by means of a spinal manometer adjusted to the zero level 4 cm. below the angle of Louis. Blood pressure and vital capacity were recorded in the usual manner. Urinalysis included protein determination by sulfosalicylic acid method, specific gravity, reducing substances, and microscopic examination for erythrocytes, leukocytes, and casts. Nonprotein nitrogen phenolsulfonphthalein determinations, and creatinine clearance were done in the usual manner. Liver function studies included bromsulfalein (5 mg./kg. intravenously) with determinations at 10 and 30 minutes, cephalin flocculation,[10] and total serum protein, albumin and globulin determination by micro-Kjeldahl, using Howe's fractionation procedure.[11] Hematocrit determinations were done by Wintrobe's method.[12]

RESULTS

It may be seen from *Table 1* that 500 cc. of dextran has been injected into a group of patients having many different diseases. No reactions were noted in any of these patients. Neither immediate nor delayed elevations of temperature were noted. The respiration, pulse rate, and blood pressure remained unaltered during the injection and in the period following injection. Vital capacity measurements on 10 of these patients did not change after injection. Venous pressure increased 10-30 mm. H_2O during the injection and returned to normal within a period of one hour.

Renal function, as studied by the usual tests (microscopic examination and tests for protein and reducing substances), failed to show any alterations following dextran injection. The specific gravity of the urine increased as a result of dextran excretion, but the density of the urine returned to normal as the dextran concentration diminished. The plasma nonprotein nitrogen did not change from the control value immediately following dextran injection or for periods up to six months after injection. There was no change in the phenolsulfonphthalein in studies of 10 patients before and after dextran injection. The creatinine clearance also remained unaltered.

Clinical tests usually associated with some phase of hepatic function, bromsulfalein, cephalin flocculation, icterus index, and thymol turbidity showed no variation from the pre-dextran injection values in 10 patients. The total serum proteins characteristically decreased following dextran administration. The results of repeated studies on 10 patients are presented in *Table 2*. It may be seen that an immediate decrease in the total proteins follows dextran injection. This change persisted for at least six hours, and in four patients for twenty-four hours. However, the serum protein had returned to normal in all patients 48 hours after injection.

Hematocrit values always decreased as a result of hemodilution produced by intravascular dextran (*Table 3*). It may be seen that an immediate decrease in hematocrit follows dextran injection. This change persisted for two hours, and the hematocrit was returning to normal six hours after injection. The hematocrit in two of eight patients was not completely normal at 24 hours, whereas all determinations were normal 48 hours after injection. *Chart 1* shows the

TOTAL PLASMA PROTEIN FOLLOWING INTRAVENOUS DEXTRAN

Control grams	After grams	6 hr. grams	24 hr. grams	48 hr. grams	72 hr. grams
7.3	5.7	6.2	6.5	7.2	
7.5	6.1	6.4	7.4	7.5	
6.4	5.3	5.4	6.5	6.4	
7.7	6.8	6.6	6.7	7.0	7.4
7.5	6.5		7.2	7.3	7.5
7.6	6.5		6.7	7.6	
8.3	6.3		7.7	8.1	
7.2	5.6		6.5	7.6	
7.2	6.7		7.2	7.3	
7.6	6.4		7.8		

500 cc. of 6 per cent dextran i.v.

TABLE 2

HEMATOCRIT FOLLOWING INTRAVENOUS DEXTRAN

Control	After	2 hr.	6 hr.	24 hr.	48 hr.
33	30	28	31	35	
45	42	42	41	44	
40	34	37	38	39	
41	38			38	45
45	40			43	45
33	28			34	34
44	38			44	45
45	36			45	45
47	40				
33	30				
43	39				
52	43				
45	37				

TABLE 3

COMPARISON OF HEMATOCRIT AND TOTAL SERUM PROTEIN
FOLLOWING 500 CC 6% DEXTRAN

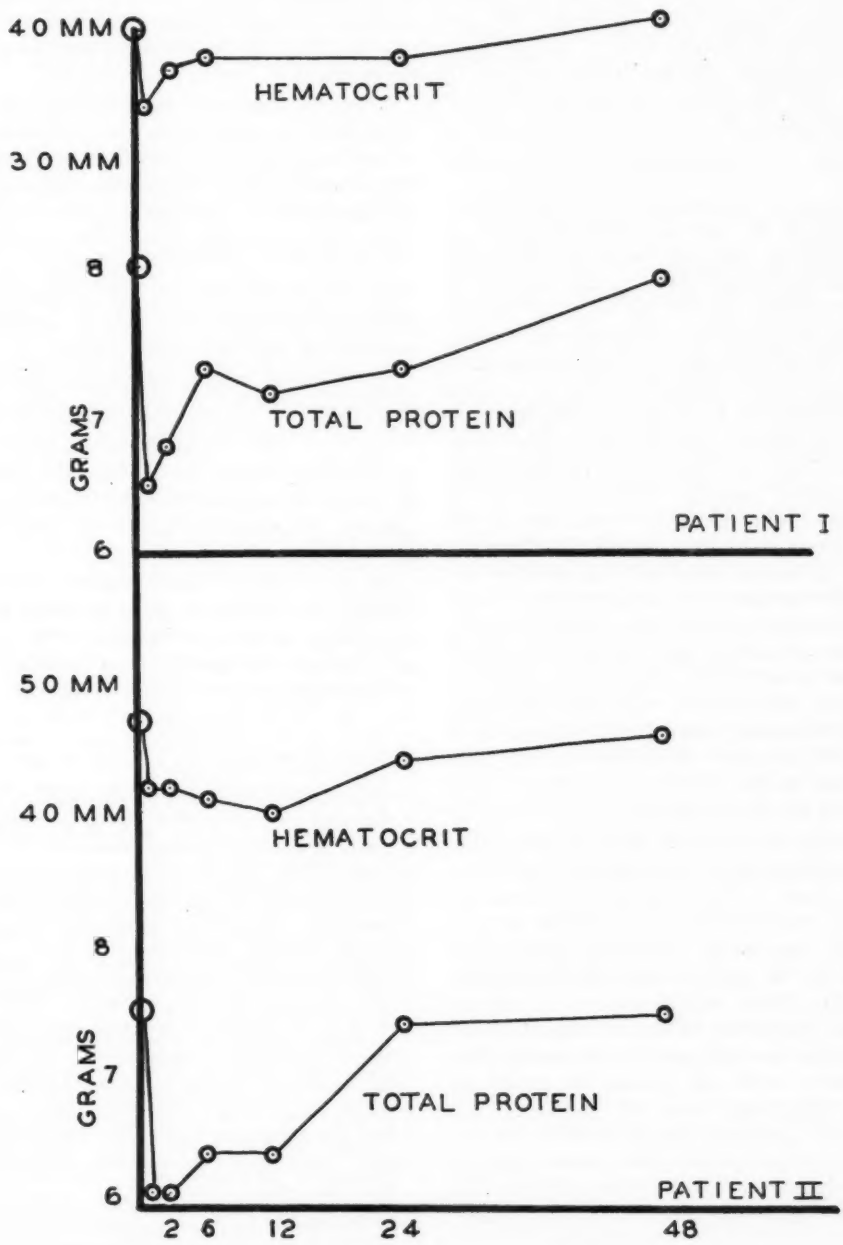

CHART 1

simultaneous serum protein and hematocrit changes in two patients. Hematocrit studies on the 13 patients show an average immediate decrease of 12.7 ± 1.2 per cent* of the control value. This change is in agreement with the decrease in serum proteins 16.8 ± 1.55 per cent.[2] The sedimentation rate was increased in all 13 patients, and this finding returned to normal as previously reported.[1 2]

DISCUSSION

The previous unfavorable reports about dextran reactions in man are either the result of some particular physical property (molecular size, molecular weight, or molecular shape) or a chemical property such as the degree of branching produced by a strain of Leuconostoc mesenteroides. A third possibility is that a contaminant is associated with certain preparations; such a material might be a nitrogenous antigenic material or possibly an unhydrolyzed dextran molecule which may be a more effective hapten than the hydrolyzed material. Another point to be considered in the problem of reactions is the interesting observation of Pulaski[13] on the rat reaction to dextran injection. This reaction has superficial similarities to the reactions reported in man. Despite the complexity of the problem, it may be pointed out that reactions to dextran need not result if the material is properly hydrolyzed, fractionated, and tested to meet rigid specifications. Undoubtedly future studies will clarify the nature of the previous reactions which have to date impeded acceptance of this material in the United States.

These data show that the dextran used in this study produces and maintains an expanded plasma volume. There are no immediate reactions or clinical evidence of renal or hepatic functional impairment following injection of dextran. On the basis of these observations the therapeutic efficacy of this material in clinical conditions associated with decreased blood volume seems assured, and it now appears that the impasse which has existed in regard to "plasma substitutes" may be overcome. Although it is apparent that a material for expansion of plasma volume is of utmost value in civilian defense and in military medicine, it might be emphasized that there is an equally large area in routine emergency medicine and in rural practice where a stable, non-injurious plasma volume expander is needed. Another point to be stressed is that once a practical material is found for plasma volume expansion, a number of other materials for a similar purpose can be developed.

These findings in no way indicate that less whole blood is needed, since the practical plasma volume expanders are only effective as osmotic agents and do not substitute for many complex functions of blood or plasma.

*Standard error of the mean.

SUMMARY

(1) Fifty male patients, convalescent from a variety of diseases, have received intravenous injections of dextran without reaction.

(2) No renal or hepatic functional alterations, as measured by clinical methods, were observed following dextran injection.

(3) Hemodilution, as evidenced by hematocrit and total serum protein determinations, was produced and maintained following intravenous dextran injection.

(4) The value of clinical dextran for use in emergency or disaster problems is evident on the basis of the capacity of this material to expand and maintain the plasma volume without reaction or impairment of renal or hepatic function.

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VAGINAL HYSTERECTOMY ON A TEACHING SERVICE*

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A training program for physicians in any of the specialties employing surgery must be one which includes a knowledge of those surgical procedures, common or otherwise, which under suitable circumstances the surgeon may be called upon to perform. Our training program for residents in gynecology and obstetrics has been gratifyingly successful in teaching them to perform abdominal total hysterectomies in all cases unless there was some definite contraindication. Up to the past four years vaginal hysterectomy was employed for prolapsus only.

About ten years ago the senior author felt the pressure emanating from Chicago to extend the indications for vaginal hysterectomy to conditions other than prolapsus. There was much we needed to learn about the broadening scope of the operation. On a number of occasions visitors who were known to have a particular interest in vaginal hysterectomy were invited to make rounds and select cases for demonstration of their technic in the removal of the non-prolapsed uterus. Because of the type of pathology encountered on our wards it was difficult to find suitable material. There were conflicting opinions among our staff as to what the indications should be for extending the operation to the non-prolapsed group. We were skeptical when told that the removal of the virgin uterus was easier than the prolapsed one. However, a growing interest mixed with curiosity plus the prodding by residents led to the development of a teaching program with special emphasis on vaginal hysterectomy in well chosen cases. This necessitated the obligation of all who were interested to find and recognize suitable material. The junior author is one of the pioneer procurors. We must mention that our teaching hospital, the John Gaston of Memphis, is primarily a city charity institution and, therefore, admissions cannot be selected on the merits of their teaching value. It is necessary for us to adapt unstrained admissions to special problems, which may make our preliminary report of peculiar interest. The series being reported is too small for more than a testimony of our efforts to incorporate in our resident training program the trend to perform more vaginal total hysterectomies in carefully selected cases as an alternative to abdominal total hysterectomies.

During the four years ending December 1950, 123 vaginal and 998 abdominal hysterectomies were performed. Forty-seven of the former were for the ancient and classical indication of complete prolapsus. The remaining 76 were the group to which the extended indications were applied. We endeavored to adhere to the generally accepted contraindications, namely, previous pelvic surgery, a uterus larger than a three months' gestation, evidence of extensive pelvic adhesions, and extra-uterine masses. Malignancies were not operated upon vaginally.

It will be noted in *Table 1* that the second largest group is comprised of cervicitis alone or cervicitis in association with rectocele and cystocele. A diseased cervix in a woman past the childbearing period is probably the most ideal condition to which the extended indications for vaginal hysterectomy may be applied. Here, instead of the amputation or extensive conization, the complete extirpation becomes the ideal. Given a patient in need of a vaginal repair who has a diseased cervix or a bleeding uterus not larger

INDICATIONS FOR VAGINAL HYSTERECTOMY
1947-1950

		Cases
Complete prolapsus	35	
Prolapse and fibroid	12	
		47
Cystocele, rectocele and cervicitis	41	
Cervicitis	5	
		46
Fibroid		19
Cystocele		5
Cystocele, rectocele and fibroid		4
Leukoplakia		1
Endometrial polyp		1
Total		123

TABLE 1

*Read in Section on Gynecology, Southern Medical Association, Forty-Fifth Annual Meeting, Dallas, Texas, November 5-8, 1951.

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than a three months' gestation in whom hysterectomy has been selected, the vaginal approach is the procedure of choice. Fifty-five of our cases fell into this group.

In addition to the removal of the uterus, other surgery was done in 116 cases as listed in *Table 2*. Repair of a cystocele or rectocele, or both, was done in 100 cases. There were five cases in which it was necessary to morcellate the fibroid. Although the results were good in these morcellations, and hospitalization was not prolonged beyond the average, we are not encouraging this type of management. The surgical supervisor is always ready to permit the operator to change from the vaginal to an abdominal approach, and on two occasions we have done this.

As is reflected in *Table 3*, an analysis of the ages reveals that three patients were under 30 years. In two of these vaginal hysterectomy was done because of fibroids, and in the third, the mother of four children, the indication was severe cystocele.

MULTIPLE PROCEDURES
1947-1950

	Cases
Vaginal hysterectomy plus repair of cystocele, rectocele, or both	100
Vaginal hysterectomy plus bilateral salpingo-oophorectomy	5
Vaginal hysterectomy plus unilateral salpingo-oophorectomy	6
Vaginal hysterectomy plus morcellation of fibroid and bilateral salpingo-oophorectomy	1
Vaginal hysterectomy plus morcellation and unilateral salpingo-oophorectomy	1
Vaginal hysterectomy plus morcellation of fibroid	3
Total	116

TABLE 2

VAGINAL HYSTERECTOMIES ACCORDING TO AGES
1947-1950

Ages	Cases
20-30	3
30-40	39
40-50	51
50-60	16
60-80	14
Total	123

In the same four-year period 998 abdominal hysterectomies were performed.

TABLE 3

Four of our patients were nulliparas as is shown in *Table 4*. These patients had bleeding fibroids and were between the ages of 36 and 39 years. There were 14 who had ten or more living children.

Although a surgical procedure may appeal because of convenience or as evidence of progress, it must also meet the standards of other well established technics. Morbidity in our patients was too high, but we did not have a death. This high morbidity will, we have reason to believe, decrease with the perfection of technic. Up to now we have not used prophylactic antibiotics. It will be seen in *Table 5* that 21 patients developed urinary infections, and this condition represented the largest single group of complications. There were 32 minor complications which did not lend themselves to specific diagnosis and are here classified as "miscellaneous." The criterion by which we determined morbidity was the elevation of temperature to 100.4 degrees on two or more days after the first 24 hours. The major complications of cuff abscess and hemorrhage should be reduced or practically eliminated by better surgery. As to whether drainage would have prevented these complicating conditions cannot be answered from our experience, as drains have not been employed.

PARITY IN VAGINAL HYSTERECTOMIES
1947-1950

Cases	Parity
4	0
11	1
108 (14 para 10 plus)	1 plus

The ages of para 0 were 36, 37, 38, and 39 years with the diagnosis of bleeding fibroid.

TABLE 4

COMPLICATIONS IN VAGINAL HYSTERECTOMIES
1947-1950

	Cases
Urinary	21
Vaginal cuff abscess or inflammation	4
Vaginal hemorrhage, packed	3
Peritonitis with ileus	2
Miscellaneous	32
Total	62

TABLE 5

The average postoperative hospitalization was 12.25 days which is longer than that required for our abdominal hysterectomies. Again, we believe that when the collective experience of the staff approaches that which they have had with abdominal hysterectomy, this difference will be eradicated. This feeling is not false optimism but is occasioned by the reports of others whose second series show definite improvement in all phases.

The followup of these patients has been most satisfactory. Only seven have not returned for at least one visit. Nine months after the first operation for complete prolapse with incontinence, one patient had to have a secondary repair which completely relieved her annoying symptoms.

As we appraise our limited excursion into this modern resurgence of vaginal surgery, we are elated over extending the operation to the nonprolapsed diseased or dysfunctioning uterus. Those of us who had previously done the two-stage operation at one sitting welcome the advantages of doing it from below.

The disadvantage of not being able to do a routine prophylactic appendectomy, as well as the inability to explore the abdomen, will dampen the enthusiasm of the abdominally minded gynecologic surgeon. Time alone will substantiate or disprove the validity of these objections. Meanwhile, it is our conviction that the gynecologist must be trained in the technic of the operation so that he can employ it with safety when its advantages outweigh the real or supposed disadvantages.

SUMMARY

(1) A series of 123 cases of vaginal hysterectomy is presented.

(2) In addition to the classical indication of prolapsed uteri, the operation was done for benign enlargements and extensive disease of the cervix.

(3) The feasibility of plastic repair simultaneous with hysterectomy makes it imperative for the gynecologist to be adept at the technic.

(4) Vaginal hysterectomy for non-prolapsed uteri was incorporated as a practical part of the training program for gynecologic residents.

(5) The immediate morbidity revealed the need for constant diligence in improving technic. Likewise, late morbidity or failures should be reduced as experience increases.

DISCUSSION (*Abstract*)

Dr. Joseph W. Kelso, Oklahoma City, Okla.—Inasmuch as the authors' review, which is apparently the first report from their institution that includes the vaginal removal of the uterus without existing prolapsus, dates back only four years, I must assume that they appear in the role of pioneers in the city of Memphis. I wish to encourage them, because they have, apparently, proceeded against critical resistance. I shared in a similar role some fifteen years ago and accept some of the responsibility for instituting the adequate use of pelvic surgery in our locality. The effects of that effort are demonstrated in the fact that the incidence of vaginal hysterectomy has risen on our service at the University Hospital from the occasional case of extensive vaginal herniosis in 1941 to 32.4 per cent for the year ending June 30, 1951. This increase has resulted from the development of young men interested in perfecting their technical skill in order that they may successfully complete these more difficult assignments. In the past ten years, the percentage has almost tripled, but this increase has been gradual, which is, in itself, an excellent barometer for its recommendation.

I must comment on the low incidence of morcellation in this reported group, only five out of the 123 cases. I probably morcellate 50 per cent of the cases I do in my private service and accept it as part of the routine operation, if need arises. By all means, morcellate the specimen at the expense of the tumor and not at the expense of the patient or the operator! The higher incidence of this operation accepted by Dr. Schreier and Dr. Green, the higher the percentage of morcellation they will find necessary. This maneuver facilitates the operation and changes a difficult procedure into an easy one.

The contraindications as outlined are standard. However, previous pelvic surgery is no definite contraindication. Adnexal masses can be readily managed through the vaginal approach, and, with morcellation at one's disposal, the size of the tumor is not the deciding factor. A thorough pelvic examination, with an adequate knowledge of the extent of the existing pathology, is the deciding factor in the election to operate upon the patient vaginally or abdominally.

The urinary complications are troublesome and do occur with considerable frequency. Retention catheters are used, and infection is liable to develop. Prophylactic sulfonamides are used on our service with an appreciable reduction in this incidence. In addition, I use prophylactic penicillin and feel that it, likewise, has reduced our urinary complications. The authors' incidence of cuff abscesses and hemorrhages are too high, but these troublesome complications will almost disappear as their training program progresses. No mention is made of vaginal preparation or of postoperative care, and in these they

may find the solution to their difficulties. I have practically eliminated these two complications by the use of a sulfonamide and lactose preparation preoperatively and postoperatively, and I recommend it highly. I have not yet used penicillin suppositories, but unquestionably penicillin given prophylactically has lowered my morbidity figure and has reduced the incidence of the separation of the vaginal vault which necessitates healing by secondary intention. In my opinion, except in rare instances, drains have no place in vaginal surgery.

The easiest operation I do is the vaginal hysterectomy in a woman with little or no descensus of the uterus and with an average spaciousness of the vagina. The hardest operation I do is in a woman with an extensive prolapse and an eversion of the vagina. The simple amputation of the protruding atrophic uterus is an operation which can be accomplished by the rank amateur, but the reconstruction of pelvic support is a rigid task for an experienced vaginal surgeon. In a recent review of my private cases, I find that I have been doing 48.4 per cent of my hysterectomies through the vagina. If the cases of malignancies were removed from this total, the percentage would be approximately 55.

A few months ago, one of our most capable young men, whom I had helped train, was called into the Army. In the course of time, he attempted to schedule a case for a vaginal hysterectomy. He was confronted with the rebuke that he should do the case by the abdominal route, that in the Army only acceptable and standard procedures were done! My first inclination was to tell him to speak out like a man and defend his position, since the vaginal hysterectomy is an acceptable and standard gynecologic procedure. Of course, such insubordination is not tolerated in the better military circles, and the case was operated upon abdominally.

Nevertheless, the vaginal hysterectomy is a valuable gynecological operation, and every gynecologist should be trained to do a hysterectomy with as much ease vaginally as he does abdominally, allowing him then to elect and perfect his choice of approach. I commend the authors on their approach to the teaching of this procedure, for that is how they are attempting to train their men. They are advancing with care, and no doubt are being observed closely by their fellow men.

Our incidence of vaginal hysterectomy of 24.6 per cent over the same space of time is higher on our University Hospital service than the approximately 11 per cent in this report. Their incidence of Negro patients will reduce the adaptation of the operation, but will increase as they interest more young gynecologists in perfection of their technic to do cases without uterine prolapsus by the vaginal route.

We must not compare vaginal surgery with abdominal surgery. It just cannot be done, for they are two entirely different problems. You will be extremely pleased with vaginal surgery in the patients without prolapse who need reconstructive surgery. You will be pleased with vaginal hysterectomy in the elderly woman, the obese woman, and the woman who demands a hysterectomy in whom existing systemic complications make an abdominal procedure too hazardous.

Dr. R. L. Sanders, Memphis, Tenn.—Drs. Schreier and Green have performed a real service in bringing the subject of vaginal hysterectomy to our attention. In my attendance at medical meetings over many years I have rarely heard the matter discussed, and certainly not from the angle presented here.

I have long taught and practiced vaginal hysterectomy. When indicated, it is a most useful operation. It is certainly less shocking to the patient than the abdominal approach, and in the presence of uterine prolapse, especially, is superior to any other procedure.

Particularly do I agree with what Dr. Schreier has said about teaching young men to perform this operation. From my observations, it seems that most young surgeons and even some older ones avoid vaginal hysterectomy on account of the possible damage to the bladder, ureters and other important structures. Each time they have occasion to use it, this fear leads them to wait until the next opportunity arises. If those of us who are familiar with vaginal hysterectomy would make a point of teaching the younger men the proper technic and would urge that they school themselves in its performance, we should render a great service.

Dr. Schreier (closing).—We believe vaginal hysterectomy for chronic hypertrophic cervicitis is better in selected instances than amputation or deep conization. Instead of the high amputation the clamps are placed higher on the broad ligaments and a useless half uterus is not left.

PENTOTHAL:® A LIGHT ANESTHETIC AGENT*

By RANDLE J. BRADY, M.D.
Houston, Texas

(1) Pentothal® is an anesthetic agent.

(2) Pentothal® is a good anesthetic.

(3) Like nitrous oxide it is a light anesthetic agent.[1]

(4) It definitely is not a deep anesthetic and like nitrous oxide should never be used as such.

In 1946 I[2] read a paper before the Southern Medical Association advocating the use of nitrous oxide and pentothal® for operations requiring first plane anesthesia such as skin grafts, orthopedic cases, breasts, and vein ligations. The reason for this combined anesthetic was as follows. Pentothal® is the best sleep producer of all our anesthetics. Induction is pleasant and

*Read in Section on Anesthesiology, Southern Medical Association, Forty-Fifth Annual Meeting, Dallas, Texas, November 5-8, 1951.

gentle, and the patient can be carried in very light anesthesia during waiting periods without the patient vomiting or going back into the second stage of excitement. In fact, the excitement stage is practically eliminated. Pentothal,® while being a good sleep producer, is not a good pain reliever. Nitrous oxide on the other hand is a good pain reliever but a poor sleep producer. The combination makes for pleasant first plane sleep with good pain relief.

At that time I reasoned that if to the already present pleasant sleep and good pain relief could muscular relaxation with curare be added, then a theoretically perfect combined anesthesia for abdominal surgery was at hand. I anesthetized a series of one hundred consecutive pelvic laparotomies with pentothal,® nitrous oxide, and curare. About two-thirds of the cases were done with a reasonable safety, but in the other third there was too much sleep or too much pentothal® action. I had gone from barbiturate anesthesia over into barbiturate poisoning, which frequently happens[3 10] when pentothal® is used for deep anesthesia of second and third plane. Let me cite a typical example.

A 25-year-old white woman, rather thin, underwent a pelvic laparotomy lasting about one hour. The anesthetic was 0.7 gram of pentothal® plus 3.5 cc. of tubocurarine plus 80-20 nitrous oxide and oxygen. At the end of surgery her systolic blood pressure was 60, her pulse was 60 and regular, the respirations were shallow and regular. No special postoperative care was given except to see that her airway remained open. About six hours later, at night fall, the patient moved and then went back to sleep and awoke the following morning.

At that time and now, I am convinced that if deep anesthesia is wanted, a deep anesthetic agent such as cyclopropane or ether must be added to the pentothal.® If first plane anesthesia is wanted, then pentothal® and nitrous oxide with or without curare are ideal. For second and third plane anesthesia pentothal® and cyclopropane with curare, or pentothal® and ether, are much safer than trying to stretch first plane pentothal® combinations. To be specific: do plastic, orthopedic, breasts, and vein ligations with pentothal® and nitrous oxide. Belly cases require deep anesthesia and can be done with pentothal® and cyclopropane with curare, or pentothal® and ether with curare.

The anesthetist who sits on one side of a patient and gives an anesthetic to an arm is in my opinion neglecting his patient. This is particularly true in deep anesthesia as the patient is already in a state of barbiturate poisoning, and a more accurate control of the patient's breathing should be kept. There are those who contend that it is not necessary to have a contact with the patient's respiratory apparatus. To me this is in error as every anesthetic, be it spinal, intravenous, or inhalation, is a breathing anesthetic, and the following two things must be present: one, an open airway; and two, an adequate respiratory exchange. Too often in deep pentothal® anesthesia, the airway is open but the respiratory exchange is not adequate during the surgery and for many hours afterward. The floor nurses giving postoperative care are frightened as they cannot tell whether the patient is breathing or not. This so-called diffusion type of respiration is not enough and many more of these patients would die were it not for the fact that pentothal® reduces the brain metabolism so that it stands oxygen want. Many experiments, such as those of Draper and Whitehead,[4] have shown that dogs under pentothal® anesthesia undergo severe oxygen want and high increases of carbon dioxide and can be physically revived with oxygen. Man, on the other hand, is not only a physical animal but a mental one also; and it is my opinion that severe anoxia and hypercarbia has a varying but definite effect on the patient mentally. Let me cite an example.

The patient was a colored woman about forty years of age who was put to sleep with pentothal® and curare. The patient was put in steep Trendelenberg position and the abdomen opened for hysterectomy. At this time the nurse anesthetist noticed that the patient was in poor condition so she tried to give the patient cyclopropane and oxygen by inhalation and found the airway obstructed. A frantic call went out for help and an available medical anesthetist quickly took the patient out of Trendelenberg position and put in an endotracheal tube. It was estimated that the period of severe hypoxia or anoxia had been present for about fifteen minutes. The patient was given artificial respiration with 100 per cent oxygen for fifteen minutes, at the end of which time her condition seemed satisfactory so the operation was completed and the patient returned to her bed. About two hours later convulsions started and lasted for three days. On the eighth day the patient regained consciousness and complained of numbness and tingling in both hands and feet. At the end of one month a slight foot drop on the right side persisted. At this time she appeared very happy but slightly silly and reminded me of some of the prefrontal lobotomies I have seen.

Doing rectal surgery under pentothal® is absurd as it requires a very deep brain anesthetic, while the tail end can be blocked out easily by the saddle block or caudal technic without affecting the brain and other vital organs at all. When such a simple method of blocking the sacral nerves is available, why use a dangerous deep brain anesthetic?

Pentothal® has been the most misused of all anesthetic agents. For fourteen years the makers of pentothal® included a brochure with each ampoule of pentothal® saying that it was an anesthetic agent for operations of short duration. I have contended before you and before them that this is not true, but that pentothal® is a light anesthetic agent. This brochure gave many people the impression that it was all right to slug persons with pentothal® into deep anesthesia just so they did not do it for a long period of time. Many dentists are operating upon the same theory and they give one hundred per cent nitrous oxide to a patient until he is black in the face and then stop the nitrous oxide and pull the tooth. Both these short deep anesthesias using light agents are poor anesthetic technics. Another unfortunate episode contributing to the misuse of pentothal® was a motion picture distributed freely by one of the makers of curare advocating slugging the patient both with pentothal® and curare for belly surgery. The influence of this picture has contributed greatly to the misuse of pentothal® in belly surgery.

During the late war, in the European theatre of operations, the death rate from pentothal® rose until it was four times as high as for other anesthetic procedures. Dr. Tovell[6] investigated this and took measures that corrected the mortality quickly. He did not stop the use of pentothal® as it was a good agent but simply stopped its use in belly and chest cases. It was dangerous in belly cases as it was being used for deep anesthesia and in the chest cases as there was no adequate control of the respiratory exchange.

Dr. Volpitto[7] has advocated the use of pentothal® and curare or evipal® and syncurine® for intubation. I dislike pentothai® for intubation as enough pentothal® is used in two minutes to provide thirty minutes anesthesia and enough curare or syncurine® is used in two minutes to complete two belly cases with cyclopropane. This is too much drug in a short period of time as evidenced by the fact that 40 per cent of his cases stopped breathing and 7 per cent stopped breathing for over ten minutes. It would be safer for the average anesthetist to intubate under cyclopropane and curare, and for the student to intubate under ether. Intubation under pentothal® should be preceded by spraying the throat with cocaine or pontocaine.®[8]

In the ideal use of pentothal® the anesthetist should have control of the airway. If pentothal® is used in head and neck surgery such as neck dissections, thyroidectomies, tonsillectomies, laryngectomies, and brain surgery, the patient should be intubated preferably under cyclopropane[5 8] and then put on pentothal® and nitrous oxide. The action of the cyclopropane wears off quickly and the patient can be carried in first plane anesthesia for any length of time with pentothal® and nitrous oxide, finishing off with nitrous oxide and having the patient awake at the end. Let me give you the example of a fifty-year-old white man who had half the jaw and half the tongue removed plus a radical neck gland dissection and tracheotomy using two grams of pentothal® plus nitrous oxide and oxygen over a six-hour period. He was finished off during the last half hour with nitrous oxide and was awake at the end.

There are several good uses to which pentothal® has been put as listed below:

(1) Pentothal can be used for induction in any type of case of any age as it takes the fear out of induction and practically eliminates the excitement stage. This is particularly important in emergency traumatic cases which have not been prepared for anesthesia.

(2) Pentothal® is a perfect supplement to spinal anesthesia well used, as deep general anesthesia is neither needed nor wanted with spinal.

(3) Alexander[9] and his group have used pentothal,® nitrous oxide and curare well for thoracoplasties, finishing them off with nitrous oxide and having the patient awake at the end.

Charles Adams[10] of the Mayo Clinic made several statements before the Ether Centennial in Boston with which I thoroughly agree. Speaking of pentothal® he said,

"Is its present lofty position in the field of anesthesiology justified? This may be answered in two ways:

as a total anesthetic agent, no; as an important supplementing and integrating agent, definitely yes."

Again I quote Adams:

"After patients have received large doses of pentothal sodium,® they react as they do to long acting barbiturates. Under these circumstances, the problem is no longer one of barbiturate hypnosis or anesthesia, but of sublethal barbiturate poisoning with the inevitable depression of respiration, circulation, and of the nervous mechanisms which control them."

CONCLUSIONS

(1) Pentothal® is a light anesthetic agent.

(2) It is best used with nitrous oxide or nitrous oxide and curare for surgery requiring light anesthesia of any duration.

(3) It is best for the anesthetist to have control of the patient's airway as pentothal® is a breathing anesthetic.

(4) Pentothal® is ideal for induction with any type of anesthetic.

(5) Pentothal® is excellent as a supplement with spinal anesthesia either when the patient is nervous or the surgeon is rough.

(6) For deep anesthesia, pentothal® should be combined with deep agents such as cyclopropane or ether, and curare added to the combination.

(7) Pentothal® is a light anesthetic agent and should be used as such.

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SOUTHERN MEDICAL ASSOCIATION
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NEW DRUGS FOR TUBERCULOSIS

Important in the antisepsis of tuberculosis is streptomycin. Para amino salycylic acid has some antituberculous activity. The effectiveness of some of the thiosemicarbazones was shown in 1946 by Domagk, the man who first took prontosil® from the dye industry and with it initiated the synthesis of the group of sulfa drugs which began a modern curative era for infections diseases.[1] In the routine screening of substances related to the thiosemicarbazones a promising group of substances related chemically to the vitamin, nicotinic acid, (pellagra preventive and curative), were independently isolated in the laboratories of Hoffmann-LaRoche, Inc. and E. R. Squibb & Sons. One of the most active of these is called isonicotinic acid nydrazide. Other derivatives have also received favorable reports. The substances have been extensively studied in the test tube, in a number of different varieties of experimental animals, and in human clinical cases.[2] Detailed experimental studies[3-7] are reported in the April issue of the *American Review of Tuberculosis*. A high degree of specificity of the products both in test tube and among small animals is shown, with a low toxicity and a wide difference between the antibacterial dose and the lethal dose for the host. The materials increased notably the survival rate of small animals infected with the tubercle bacillus. Even with a group of guinea pigs infected intracerebrally, the new products saved the animals. Different species of laboratory animals vary in their susceptibility to the toxic effects of the isonicotinic acid derivatives. Some are possibly better for one animal, some for another.

Robitzak and Selikoff[7] studied the effects of three related compounds in human pulmonary tuberculosis. All cases treated had progressed so far that no other therapy was considered useful. The sputum was positive, the temperature continuously 100-105.° In the majority there was spectacular improvement in ten days, with weight gain, disappearance of abnormal accumulations of fluid, and relief of cough and expectoration. A number of negative sputum tests were obtained after one to three months of therapy. Less toxicity was observed from the isonicotinic acid nydrazide than from the isopropyl derivative. Among toxic effects sometimes observed were vertigo and constipation, euphoria and exaggerated tendon reflexes and a transitory Babinski sign.

Reports from the American Trudeau Society and many other sources confirm the good effects to be obtained in cases of advanced and so-called untreatable tuberculosis. It is believed that the new products should increase the life expectancy of many sufferers from this far too common disease.

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THE EYE EXPOSED TO MERCURY

Long time effects of mercury upon the eye of electric meter repairers who have worked with this substance in the London area over a period of years have been reported by Locket and Nazroo[1] in the *British Medical Journal*. Their report is illustrated with beautiful colored pictures of the lens of the eye as seen in a slit lamp beam. The *British Medical Journal* has rarely or never included colored pictures of this type in its pages heretofore.

The eyes of 51 meter repairers selected at random were examined for vision and muscle balance and by the slit lamp.

Vision for the most part was not unusually altered from the normal; there was no nystagmus or muscle imbalance, or retrobulbar neuritis. However, in 29 cases obvious lens changes were seen. They were of three types, all bilateral: (1) a brown reflex from the anterior lens capsule; (2) fine punctate opacities in the lens; and (3) well-marked vascularity at the corneoscleral junction. They occurred only in those who had been exposed at least five years to mercury. They were not detected in cases of acute mercury poisoning.

There was no evidence to suggest that the brown reflex of the anterior lens capsule was the cause of any visual disturbance. This symptom persisted unchanged, even after removal from exposure of more than four years.

It was suggested that this colored reflex might be used as a screening device to detect activity of atmospheric mercury where it is used.

There are many industrial poisons to which workers are exposed and their number increases with the increasing progress of industry. Each new synthetic or each new process of manufacture carries its own perils. Much responsibility rests upon those who would preserve the health of the worker and prevent the syndromes of industrial injury. The eye may be the mirror of a number of working conditions. These studies upon the effects of mercury vapor are suggestive.

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NATURE OF AWARENESS

"Oh, sleep, it is a gentle thing
"Beloved from pole to pole,"

although its physiological nature has been a mystery throughout the ages. Workers[1] at Cornell University would relate it to the degree of anoxia in the blood stream. During normal waking hours, they say, the arterial oxygen saturation is around 96 per cent. This decreases as the subject becomes somnolent, begins to sleep lightly, and finally enters a period of deep sleep, when it is around 87-88 per cent. In awakening the subject reverses his oxygen concentrations.

But during conscious conditions also, awareness is a fluctuating variable, according to Doust and Schneider.[1] Attention may become acute or the subject may wool gather, and accompanying such variations in the pattern of awareness, is a like picture of oximetric variation. "An attention peak in consciousness is accompanied by an oxemic peak in the arterial blood saturation levels; a state of reverie or inattention is accompanied, in temporal identity, by anoxemia." Oxygen rises in the blood level as the individual concentrates his attention, and falls as he dreams.

At times when the sleeper awoke his blood oxygen saturation might be low, it was observed. The blood oxygen levels could not be correlated entirely with sleep, but rather with levels of awareness. Doust and Schneider attempt to correlate the oxygen levels also with states of schizophrenia. The schizophrenic, they say, is like a dreamer; his oxygen saturation levels are those of the dreamer. He is unaware of everything except his own unconscious. His oxygen saturation is that of the sleeper and "fluctuates uneasily as the sleeper, dreaming, twists and turns, mutters and sighs, groans, and snores his way through sleep."

These investigators have concentrated their attention upon an objective measure which may be of use to psychiatrists, anesthetists and others.

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TWENTY-FIVE YEARS AGO

From Journals of 1927

The Patenting Question.[2]—The application made by G. F. and G. H. Dick for a patent in respect of what are called "improvements in scarlet fever toxin and antitoxin and methods for producing same" will cause considerable apprehension. . . . If a system of monopoly is allowed to pervade medical science, what is to be the end of it? What is there to prevent the monopolist from stifling research, restricting the manufacture of

2. Editorial: The Patenting Question. Lancet, p. 551 (March 12) 1927.

vital remedies, or from raising the prices so high that the poor patient will have no prospect of competing for them against the rich? . . .

Thirty years ago, when E. von Behring patented his diphtheria antitoxin, professional opinion in Germany and elsewhere was naturally hostile to the piling up of personal fortunes from biological patents: the patent was everywhere ignored and no effective protest was made by the patentee. Since then the attempt to use the machinery of patent laws for the benefit of the discoverer of a drug or process have been chiefly concerned with new synthetic drugs, of which salvarsan is an example. Of recent years, however, another invasion of commercialism into the marketing of biological products has been manifest. Insulin was patented by the University of Toronto, presumably in order that the proceeds might be used to further research . . . manufacturers were left free to produce for commercial purposes a parathyroid extract prepared by Collip's method, and we have already been able to publish accounts of the valuable clinical results obtained by its use . . . the Exchequer will remember that a not inconsiderable revenue is derived from the stamp duties on proprietary medicines . . . What is to be the effect upon medical research if the Patent Acts are invoked to protect each stage in scientific progress? Rewards will be claimed for the man who gives the finishing touch, perhaps almost accidentally, to work done by men in many countries and for many years without reward . . . The medical profession will unhesitatingly repudiate the commercial exploitation of scientific discoveries which relieve pain and cure or prevent disease . . . This country is not likely to tolerate [monopolies] today in the sphere of medical treatment.

Vitamin E and Iron Assimilation.[1]—In 1922-3, Evans and Bishop reported a remarkable series of experiments relative to the failure of young rats to give birth to young when fed a diet composed of casein . . corn starch . . butter fat . . salts . . lard . . and dry yeast. A detailed study of these females revealed that they became pregnant but invariably resorption of the young resulted. The males were not confined to the experimental diet. . . . Evans later reported that their experimental diet induced sterility in male rats. They demonstrated the remarkable effectiveness of wheat germ oil, among other things, in preventing the death and resorption of the young. It also protects males against degeneration of the germinal epithelium. . . .

For some years we have been designing experiments to establish whether the so-called vitamin B is of single or multiple nature. . . . In vitamin E we have a substance specifically related to iron assimilation in a manner comparable to the relation of vitamin D to phosphorus and calcium metabolism . . the fats of beef liver contain vitamin E. Since liver is rich in iron and in the vitamin in question, we appear to have in our work an explanation for the therapeutic value of liver in the treatment of pernicious anemia, as recently suggested by Minot and Murphy. . . . The death of the fetuses in rats on diets deficient in this vitamin [E] is due to a crisis in their iron assimilation.

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Treatment of Epilepsy.[1]—The treatment of epilepsy may be summarized in a few words: diet, phenobarbital (and its salts) and psychotherapy. . . . The most striking and effective treatment of epilepsy is starvation. . . . During fasting and coincident with the improvement in the epilepsy . . . there is a considerable increase in the excretion of ketone bodies in the blood, alveolar air, and urine . . . a slight drop in the pH. . . . It was suggested . . . that acidosis was the factor responsible for the influence of starvation on epilepsy . . . Wilder . . . proposed a high fat diet for the treatment of epilepsy . . . The ketogenic diet . . . was described in 1924. . . . Concomitant with the ketosis, when diacetic acid appears in the urine the attacks usually cease or are greatly diminished in number. . . . Both ketosis and a tendency toward acidosis are necessary for the control of convulsions. . . . The success of the ketogenic diet in the treatment of epilepsy is entirely a question of the ability to carry out the prescribed diet in careful detail. Fourteen epileptic children have completed the ketogenic diet treatment and are now on normal diets. All . . . have been free of epileptic attacks for from six months to three years after the change to normal diet.

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Book Reviews

Psychosomatic Gynecology: Including Problems of Obstetrical Care. By William S. Kroger, M.D., Assistant Clinical Professor of Obstetrics and Gynecology, Chicago Medical School; and S. Charles Freed, M.D., Adjunct in Medicine, Mount Zion Hospital, San Francisco, California. 503 pages. Philadelphia and London: W. B. Saunders Company, 1951. Price $8.00.

This text is the first excellent attempt to orient obstetricians and gynecologists to their own personal problems in the physician-patient relationship, as well as to the emotional factors in diseases of women. It may surprise many a gynecologist to find that eminent men such as Walthard, Pfannenstiel, and Grafenberg several decades ago required their students to take psychiatric training, and to recognize the elements of comprehensive medicine rather than ultra specialization. One can now detect the fascinating drama of converging ideas in what used to be the battleground of physiologist, psychiatrist and lay analyst. With Cannon, Selye and Wolff, support is everywhere now for the multi-disciplined approach.

This book contains five parts, the first two concerned with pregnancy. There will be rather slow acceptance of the first chapter, but immediate enthusiasm for the sections on frigidity, pruritus vulvae, and psychogynecic therapy. One of the authors is obviously less oriented dynamically: witness an ill-chosen case report of the 32-year-old woman on page 380. The only topic, perhaps too large, which has not been included is surgery of the intersexuals. The authors have produced a *sine qua non* for any physician seeing female patients. The exhaustive bibliography alone is worth the price of the book.

Textbook of Refraction. By Edwin Forbes Tait, M.D., Ph.D., Associate Professor of Ophthalmology, Temple University School of Medicine, Philadelphia. 418 pages, illustrated. Philadelphia and London: W. B. Saunders Company, 1951. Price $8.00.

This work is a striking departure from the usual refraction presentation, which begins with a study of concave mirrors and labors through geometric and physiologic optics. After a chapter on the fundamentals of light, it proceeds as an ophthalmologist would with a patient. One is constantly reminded of the physiology of the eye and the psychology of the patient, which factors are most important in evaluating the actual refractive errors.

Immediately it is evident that an erudite author has given much reflection to the ideas that he presents and to the words used for conveying them. Considerable thought has been given to the validity of terms in popular use. As an example, he explains why "suppression amblyopia" is much more accurate than "amblyopia ex anopsia."

The various phases of the examination for refractive errors and the instruments that are used to achieve them are more than adequately described. The methods of examination of binocular coordination and for motor anomalies are shown. The fundamentals of orthoptics are well presented. Dr. Tait is obviously quite conversant with optometric literature, and from this source has collected and included many facts of interest to the ophthalmologist.

This book should be read with real interest by every ophthalmologist for increased knowledge, and also for pleasure and for stimulation of his thinking upon the underlying philosophy of refraction.

The Early Diagnosis of the Acute Abdomen. By Zachary Cope, B.A., M.D., M.S. Lond., F.R.C.S. Eng., Consulting Surgeon to St. Mary's Hospital, Paddington, and to the Bolingbroke Hospital, Wandsworth Common. Tenth edition. 270 pages with illustrations. London: Oxford University Press, 1951. Price $3.50.

This little volume now in its tenth edition with only minor changes since the ninth edition remains a very practical treatise on diagnosis of the acute abdomen. The consideration of symptoms in the light of related anatomy and physiology makes it a valuable guide especially to the student and general practitioner for whom it seems to have been written. Its conciseness and brevity and the clarity of its diction together with good printing contribute greatly to its usefulness. The busy surgeon will find in it a review of the subject well worth the short time it takes to peruse it.

One cannot agree with the author's assumption that surgery is the preferred treatment in acute pancreatitis. One also would wish to see included among the diseases which simulate the acute abdomen, the abdominal crises sometimes seen in sickle cell anemia and the violent abdominal cramps due to the bite of the black widow spider (Latrodectus mactans).

The author and the publisher have done a good service to the physician and his patients by making available this new edition.

Symposium on the Health Personality. Transactions of Special Meetings of Conference on Infancy and Childhood, June 8-9 and July 3-4, 1950, New York City. Edited by Milton J. E. Senn, M.D., Departments of Pediatrics and Psychiatry School of Medicine, Yale University, New Haven, Connecticut. Supplement II: Problems of Infancy and Childhood, Transaction of Fourth Conference, March, 1950. 298 pages. Packanack Lake, New Jersey: Josiah Macy, Jr. Foundation Publications, 1950. Price $2.50.

A very interesting and instructive report on the Conference on Problems of Infancy and Childhood, held in 1950. The conference is in the form of a panel discussion by outstanding professional participants. The main point of the discussion is how to raise healthy personalities with constitutional factors, physical handicap and sociological background. It stresses the ego identity and the developing of the sense of trust in a child. The discussion of constitutional and prenatal factors is illuminating, especially the impact of environment on the genes in forming hereditary traits. The endocrine system is given a prominent place in the shaping of the physical state, the behavior pattern and the postnatal progress of a child.

It is a good reference book to stimulate thinking especially for those who have had ample background in biological sciences.

Studies in Medicine. A Volume of Papers in Honor of Robert Wood Keeton. 386 pages, illustrated. Springfield, Illinois: Charles C. Thomas, Publisher, 1951. Price $8.50.

This "Festschrift" was presented to Dr. Keeton on the occasion of his retirement as head of the Department of Medicine at the University of Illinois College of Medicine. It is a collection of thirty papers contributed by his friends, associates, and students, preceded by a biographical sketch of Dr. Keeton, and by a bibliography of his work. The subject matter of this series of articles is quite diversified, covering in addition to medicine and surgery such fields as physiology, pharmacology, and laboratory science. Many are concerned with academic research of a rather specialized character. One paper gives a well-written summary of the clinical applications of ACTH and cortisone. Another discusses diagnostic bone marrow patterns in granulomas and some of the rarer diseases; unfortunately, it contains only a handful of black and white illustrations. This volume will be of interest chiefly to those who are engaged in research.

Principles and Practice of Obstetrics. Originally by Joseph B. DeLee, M.D. By J. P. Greenhill, M.D., Attending Obstetrician and Gynecologist, the Michael Reese Hospital; Professor of Gynecology, Cook County Graduate School of Medicine. Tenth edition. 1,020 pages with 1,140 illustrations. Philadelphia and London: W. B. Saunders Company, 1951. Price $12.00.

The latest edition of this famous standard textbook of obstetrics has been rewritten with great care, and "not a single page remains as it was in the last edition." Dr. Greenhill has been aided by other authorities in the preparation of chapters on special subjects. Among these, there are two interesting new sections on saddle block

anesthesia, and on venous complications during the puerperium, which still constitute an important cause of obstetric deaths. A conscientious effort has been made to incorporate not only the newer developments in obstetrics, but also the present day management of all illnesses complicating pregnancy. This is particularly true for the prophylactic and curative treatment of puerperal infections. The author recommends antibiotic prophylaxis in selected patients, in whom a febrile course may be expected. German measles contracted before the end of the third month are listed as an indication for therapeutic abortion. The appraisal of roentgenographic study in obstetrics is noteworthy for its thoroughness.

This new edition should, and probably will be, in the possession of every physician practicing obstetrics.

The Human Colon. By William J. Grace, M.D., Assistant Professor of Medicine, Cornell University Medical College, New York Hospital, New York; Stewart Wolf, M.D., Associate Professor of Medicine, Cornell University Medical College, New York Hospital, New York; and Harold G. Wolff, M.D., Professor of Medicine (Neurology), Cornell University Medical College, New York Hospital, New York. 239 pages with 112 illustrations. New York: Paul B. Hoeber, Inc., 1951. Price $7.50.

"The Human Colon" is the record of a number of highly significant observations by Grace, Wolf and Wolff on four subjects with colonic fistulae. Two of the patients had normal colons; the other two had ulcerative colitis. The authors pursued a series of psychophysiologic studies dealing with the influence of various carefully tested emotional stimuli on the colonic behavior of each of their subjects, as measured by the appearance, motility, lysozyme content, and other characteristics of the exposed colon, and the results of their studies provide a wealth of data of the greatest clinical and physiologic interest. In addition to investigating the colonic responses to various life situations, the effects of a number of pharmacologic and physical agents were also studied. The role of vagotomy, the patterns of constipation, and the mechanisms of ulcerative colitis are other subjects receiving thoughtful consideration. This book is highly recommended as a guide to the more complete understanding of colonic function and dysfunction.

Inhalation Anesthesia. By Arthur E. Guedel, M.D., Associate Clinical Professor of Surgery (Emeritus), University of Southern California School of Medicine. Second edition. 143 pages. New York: The Macmillan Company, 1951. Price $3.75.

This is a short, easily readable book dealing with all phases of inhalation anesthesia. It stresses the clinical side and practical use of anesthesia and touches only briefly on the physiological and pharmacologic aspect. Two of the most notable features of the book are the chapters on signs of anesthesia and anesthesia accidents. The former contains a clear, concise description of the stages of anesthesia and is accompanied by a well presented chart of the signs. The chapter on accidents is probably the most interestingly written and will be of value to anyone who ever gives an inhalation anesthesia. The book as a whole will prove of great value to the general practitioner who does an occasional to a moderate amount of anesthetic practice as well as to the physician who devotes all of his time to anesthesiology.

Renal Function. Transactions of the Second Conference, October 19-20, 1950, New York, New York. Edited by Stanley E. Bradley, Department of Medicine, College of Physicians and Surgeons, Columbia University. 178 pages, illustrated. Packanack Lake, New Jersey: Josiah Macy, Jr. Foundation Publications, 1951. Price $3.00.

"Renal Function" is the published record of the second Macy Foundation Conference held in October 1950, under the chairmanship of Dr. Robert F. Pitts. The seven papers presented and discussed at this conference are limited to hormonal influences on renal function. Specifically, only pituitary and adrenal cortical factors are considered. Current investigations and views regarding antidiuretic hormones, renal excretion of water and electrolytes, and pituitary-adrenal synergism and antagonism with relation to water and salt balance are among the topics reviewed. The confreres are a group of distinguished investigators active in the field of renal physiology whose pointed comments and questions add to the reader's interest.

Standard Nomenclature of Diseases and Operations. Edited by Richard J. Plunkett, M.D., Editor, and Adaline C. Hayden, R.R.L., Associate Editor. Fourth edition. 1,034 pages, illustrated. Philadelphia: The Blakiston Company, 1952. Price $8.00.

The new fourth edition of "Standard Nomenclature of Diseases and Operations" embodies a number of additions and revisions which bring it completely up to date. Advances in diagnosis and in diagnostic classification in such fields as cardiology, hematology and oncology have been recognized. Also noted have been advances in cardiac and plastic surgery. An International Statistical Classification of Diseases, Injuries and Causes of Death is included, and cross references between the International Classification and the Standard Classification are provided. A number of modifications in previously established features of the book have been made in the interest of greater efficiency. A work of integrated scholarship and authority, this fourth edition permits the coding of diseases and operations in accordance with current concepts.

Chest X-Ray Diagnosis. By Max Ritvo, M.D., Assistant Professor of Radiology, Harvard Medical School. 558 pages with 615 illustrations. Philadelphia: Lea & Febiger, 1951. Price $15.00.

With the ever increasing use of chest x-rays as a diagnostic and screening aid in medical practice, there is a growing desire among physicians better to acquaint themselves with the interpretation of such films. Dr. Max Ritvo has ably presented these criteria in his new book "Chest X-Ray Diagnosis," and his discussion is ably supplemented by over 400 illustrations of carefully selected chest films. The text is divided into ten sections, dealing not only with the lungs, but also with the

cardiovascular system, the mediastinum, the bony thorax, the soft tissues of the neck, the pleura and the mediastinum. Each of the illustrations is accompanied by a completely explanatory note, enabling the reader to peruse the illustrations as a unit, if he so desires. References to more extensive discussions in the medical literature follow each topic. The author presents a considerable amount of information in the text, in a lucid readable form. The quality of the photographic reproductions is superb. Although this is not a book of x-ray technic, the author might have included a few illustrations of badly taken, poorly developed x-rays, since the recognition of such films is of vital importance to those who read them. This well conceived and excellently produced book is recommended to anyone who wishes better to understand chest x-ray diagnosis.

Obstetrical Practice. By Alfred C. Beck, M.D., Professor Emeritus of Obstetrics and Gynecology, State University of New York College of Medicine, New York City. Fifth edition. 1,073 pages with illustrations. Baltimore: The Williams and Wilkins Company, 1951. Price $10.00.

This book is beautifully illustrated and each picture is well described. Each chapter has its own extensive bibliography, some with more than two hundred references. Many of the illustrations on the proper use of forceps, cesarean section, version and extraction and repair of perineal lacerations are in color, which adds to the attractiveness and teaching value of the text.

An appendix of twenty-two x-ray pictures is included, which illustrate problems encountered in the field of obstetrics that can be diagnosed by x-ray. A refreshing feature of the book is the inclusion of pictures and historical notes of famous physicians in the past who have contributed to making obstetrics a specialty in medicine and also to reducing the mortality and morbidity of woman in labor. All physicians who do obstetrics will enjoy and profit by using this text.

Relation of Psychological Tests to Psychiatry. Edited by Paul H. Hoch, M.D., New York State Psychiatric Institute; College of Physicians and Surgeons, Columbia University, New York City, and Joseph Zubin, Ph.D., New York State Psychiatric Institute; Department of Psychology, Columbia University, New York City. The Proceedings of the fortieth annual meeting of the American Psychopathological Association, held in New York City, June, 1950. 301 pages. New York: Grune & Stratton, Inc., 1952. Price $5.50.

This book represents an interesting beginning into the evaluation of a limited but well accepted number of more or less standard psychological tests. It represents a study of such tests by a selected group of both doctors and psychologists of established ability. While not answering all of the questions as to the value of psychological tests it throws considerable light on the whole problem and provokes thought. With this group, as with men practicing in the field, the tests which have been found of value again maintain a high score, but while of diagnostic value their weaknesses as regards prognosis and measure of ultimate recovery are again studied with the hope of finding something better. Scattered through the text are valuable points upon the question of who should actually treat psychiatric cases, from both sides of the fence; a discussion which has support on both sides and has recently become more acute. It also contains pertinent suggestions to the effect that medical men need to know more psychology along with their usual training in psychiatry, which sounds like a parodox but is not.

This volume is well worth adding to one's psychiatric library.

Physical Medicine and Rehabilitation for the Clinician. Edited by Frank H. Krusen, M.D. 371 pages with 96 illustrations. Philadelphia and London: W. B. Saunders Company, 1951. Price $6.50.

Dr. Krusen has done an admirable work in editing a series of postgraduate lectures originally prepared for the American College of Physicians. The contributors are outstanding men in the field. The majority are physicians; however, some have Ph.D. degrees, and others are social workers, and specially trained occupational therapists. Each phase of physical medicine is covered from the prescription writing necessary to acquaint the physiotherapist with methods to the specialized indications for the use of each therapeutic measure.

Separate chapters are given to the various media by which physical therapy can be administered. The language is kept reasonably simple. The measures indicated for such common conditions as backaches, arthritis, psychosomatic problems, the stiff shoulder syndrome, asthma poliomyelitis, painful feet, and hemiplegia are described fairly completely. The paraplegic, cerebral palsy, and tuberculous patient are also discussed.

Concluding chapters are devoted to the functional anatomy of the various parts of the body, with rudiments of the fundamentals of therapeutic exercise. If this well written, practical book, in a field which most clinicians still neglect, is utilized, it will contribute much to improve medical practice.

Clinical Laboratory Diagnosis. By Samuel A. Levinson, M.S., M.D., Ph.D., Director of Laboratories, University of Illinois Research and Educational Hospitals, Chicago, Illinois; Professor of Pathology, University of Illinois College of Medicine, and Robert P. MacFate, Ch.E. M.S., Ph.D., Chief, Bureau of Laboratories, Department of Health of the City of Chicago. Fourth edition, 1,146 pages with 221 illustrations. Philadelphia: Lea & Febiger, 1951. Price $12.00.

In this excellent book each chapter is complete in itself. The technics of obtaining material, the examination and findings together with the pathological findings as compared to normal and the symptomatology are presented. The introductory remarks in each chapter on physiology, chemistry and clinical pathology will coordinate the work for the busy practitioner and will refresh his mind upon the forgotten physiological processes.

The cross indexing of procedures by references to pages is time saving and useful. The appendix covers the preparation of solutions and dilutions together with informative tables.

Table 117 is a condensed presentation of important laboratory tests in common diseases.

The book has been brought up to date in hematology, toxicology and parasitology. The indecision of methods of assay of the antibiotics and revision of chemical methods are improvements in this fourth edition. The book is simple and complete and will be a great aid to both physicians and laboratory technicians.

The Integration of Psychiatry and Medicine: An Orientation for Physicians. By William B. Terhune, M.D., Medical Director, Silver Hill Foundation, New Canaan, Connecticut; Associate Clinical Professor of Psychiatry, Yale University. 177 pages. New York: Grune & Stratton, Inc., 1951. Price $2.75.

This little book with great message points out the necessity of teamwork between the physician and the psychiatrist. As the author says, the physician should treat the body, mind, spirit and the environment. Psychiatry and medicine are one and the principles of psychiatry should be utilized by all fields of medicine. The chapter on history taking is excellent in its admonition to get beyond the organic complaint and probe into the patient's past. In the chapter on psychotherapy in general practice, the relationship of the doctor to the patient and his influence on the patient are stressed.

The contribution of psychiatry to society and medicine is well presented without jargon.

There is a good outline for the study of the adaptive mechanism. Although this is a small volume, its content is immense.

Ophthalmology. By Arno E. Town, M.D. Professor of Ophthalmology, The Jefferson Medical College of Philadelphia. 511 pages with 208 illustrations and 4 plates in color. Philadelphia: Lea & Febiger, 1951. Price $10.00.

Dr. Town and eleven well qualified contributors have compiled a comprehensive and up-to-date textbook of ophthalmology.

Each chapter is well illustrated and well organized, with an excellent bibliography at the end of each. Almost any chapter may be read independently without reference to much that has preceded it. The text has been weeded of unnecessary material. Emphasis has been placed on the use of the ophthalmoscope and the interpretation of the fundus picture.

Of especial interest to the student and general physician should be the chapters on ocular therapeutics, ocular changes in general diseases, symptomatic diagnosis, and standing orders for eye accidents and injuries in industrial dispensaries. The chapter on surgery is brief but well illustrated and covers more important surgical procedures.

The chapters on physiology of vision and neuro-ophthalmology are quite exceptionally comprehensive for a book of this type.

Bacteriology of the eye, in the chapter on the conjunctiva, written by an expert in this field, describes the technic of smears, stains and cultures, and outlines the important pathogens.

The book is a valuable addition to general ophthalmic literature.

The Child in Health and Disease. A Textbook for Students and Practitioners of Medicine. By Clifford G. Grulee, M.D., Rush Professor of Pediatrics, University of Illinois; and R. Cannon Eley, M.D., Assistant Clinical Professor of Pediatrics, Children's Hospital, Children's Medical Center, Harvard University Medical School. 1,255 pages, illustrated. Baltimore: The Williams & Wilkins Company, 1952. Price $15.00.

The authors of this book have compiled the thoughts of leading physicians in their respective fields into an excellent text divided into nineteen sections.

Two sections particularly will enhance its value to students or physicians as a source of pediatric knowledge. These are (1) surgical conditions of the infant and child including the preoperative and postoperative management; and (2) miscellaneous subjects divided into chapters that are not usually included in a standard pediatric text, which are (a) first aid, (b) adoption, (c) pediatric technic, and (d) summer camps.

Section V on acute infections, which remains one of the most important phases of practical pediatric therapy, is noteworthy for its adequate and simple presentation.

The chapter on abnormalities of urinary secretion may be considered brief in view of the completeness of the text.

This edition is attractive in appearance, exceptionally well studded with charts, x-rays, and color illustrations, with an adequate bibliography and good index.

Infective Hepatitis. Studies in East Anglia during the Period 1943-47. By F. O. MacCallum, A. M. McFarlan, J. A. R. Miles, M. R. Pollock and C. Wilson. Medical Research Council Special Report Series No. 273. London, England: His Majesty's Stationery Office, 1951.

"Infective Hepatitis" is the official report of the Jaundice Committee appointed by the Medical Research Council of Britain to study the problem as it affected both civilians and military personnel in Britain during the recent war. An eastern section of England consisting of nine counties was selected as a representative area for study. The findings of the committee are described under a number of sections: epidemiological studies, clinical observations, biochemical observations, hematological and serological investigations and transmission experiments. This superb study has added considerably to knowledge of infectious hepatitis and homologous serum hepatitis. Tables and graphs illustrating the findings are used throughout and the text of the report is clearly and concisely presented. The report should be of interest to a large number of physicians.

Liver Injury. Transactions of the Ninth Conference, April 27-28, 1950, New York, New York. Edited by F. W. Hoffbauer, M.D., Department of Medicine, University of Minnesota Medical School, Minneapolis, Minnesota. 232 pages, illustrated. Packanack Lake, New Jersey: Josiah Macy, Jr. Foundation Publications, 1951. Price $3.00.

"The Transactions of the Ninth Conference on Liver Injury" published by the Josiah Macy, Jr. Foundation continues this excellent series devoted to current research in the realm of hepatic physiology and pathology. Among subjects presented and discussed in this volume

are the evaluation of liver biopsy, the physiology of hepatic blood vessels and lymphatics, experimental cirrhosis with emphasis on lipid deposition, kashiorkor, and the use of newer therapeutic agents. The reader will find many thought provoking discussions dealing not only with the relatively narrow field of histochemical technics and their pitfalls, but also with such broad questions as the pathogenesis of hepatic coma and the integration of liver function tests with alterations in hepatic structure. Lively skepticism pervades the conference, making this a highly stimulating and informative discussion. This book is recommended to all students of liver disease.

Books Received

Office Endocrinology. By Robert B. Greenblatt, B.A., M.D., C.M., Professor of Endocrinology, Medical College of Georgia. With a foreword by G. Lombard Kelly, M.D., President, Medical College of Georgia, Augusta. Fourth edition. 561 pages, illustrated. Chicago, Illinois: Charles C. Thomas, Publisher, 1952. Price $10.50.

Surgery and the Endocrine System. Physiologic Response to Surgical Trauma-Operative Management of Endocrine Dysfunction. By James D. Hardy, M.D., F.A.C.S., Assistant Professor of Surgery, University of Tennessee Medical College, Memphis. 153 pages, illustrated. Philadelphia and London: W. B. Saunders Company, 1952. Price $5.00.

Histopathological Technic. Including a Discussion of Botanical Microtechnic. By Aram A. Krajian, Sc.D., Formerly in Department of Pathology, Los Angeles County General Hospital, Los Angeles, California, and R. B. H. Gradwohl, M.D., Pathologist to Christian Hospital; Director, Gradwohl School of Laboratory and X-Ray Technique, St. Louis, Missouri. Second edition. 362 pages, illustrated. St. Louis: The C. V. Mosby Company, 1952. Price $6.75.

Preventive Medicine and Public Health. By Wilson G. Smillie, A.B., M.D., D.P.H., Sc.D. (Hon.), Professor of Public Health and Preventive Medicine, Cornell University Medical College, New York, New York. Second edition. 603 pages, illustrated. New York: The Macmillan Company, 1952. Price $7.50.

The Pathology of Diabetes Mellitus. By Shields Warren, M.D., Sc.D., Departments of Pathology of the New England Deaconess Hospital and the Harvard Medical School, Boston, Massachusetts; Director, Division of Biology and Medicine, U. S. Atomic Energy Commission, and Philip M. LeCompte, M.D., Departments of Pathology of the Faulkner Hospital and the Harvard Medical School, Boston, Massachusetts. 336 pages, illustrated. Third edition, revised. Philadelphia: Lea & Febiger, 1952. Price $7.50.

Etiology and Diagnosis in the Treatment of Infertility in Men. By Robert S. Hotchkiss, M.D., Professor and Chairman, Department of Urology, New York University Post Graduate Medical School, New York, New York. 73 pages, illustrated. Springfield, Illinois: Charles C. Thomas, Publisher, 1952. Price $2.50.

A Handbook of Operative Surgery: Surgical Gynecology, Including Important Obstetric Operations. By J. P. Greenhill, M.D., Professor of Gynecology, Cook County Graduate School of Medicine. 350 pages, illustrated. Chicago: The Year Book Publishers, Inc., 1952. Price $8.50.

Allergic Pruritus. Its Dermatologic Management. By Stephan Epstein, M.D., Editor. An official publication of The American College of Allergists, Inc. 76 pages, illustrated. St. Paul: Bruce Publishing Company, 1952.

Southern Medical News

ALABAMA

Medical College of Alabama, Birmingham, has received from the Life Insurance Medical Research Fund a grant of $14,900 for research by Dr. Richard J. Bing on the intermediary metabolism of the human heart; Dr. John F. Burnum, Tuscaloosa, a post-doctoral research fellowship carrying an award varying from $3,300 to $4,500, for research under the guidance of Dr. Eugene A. Stead, Jr., Duke University School of Medicine, Durham, North Carolina; and Charles Harry Crump, B.S., Birmingham, a pre-doctoral research fellowship carrying an award varying from $2,000 to $2,400 for research under the guidance of Dr. Tinsley R. Harrison, Medical College of Alabama, Birmingham.

Dr. Alfred A. Walker, Birmingham, emeritus professor of pediatrics, Medical College of Alabama, was honored when the 28th annual meeting of the Alabama State Pediatric Society was dedicated to him. This meeting was held in Montgomery, April 16.

Lee County Hospital, a four-story building of modern architecture located on the main highway between Opelika and Auburn, was dedicated at special ceremonies on February 10. This million-dollar, 80-bed hospital, representing six years of planning, is the nineteenth to be built under provisions of the Hill-Burton hospital aid act. Dr. Byron S. Bruce, Opelika, as chief of the medical staff, heads the thirteen physicians on the staff.

The new Veterans Administration Hospital, Birmingham, now being completed at the Medical Center, although classified as a general medical and surgical hospital, will have of the 487 beds 140 for a tuberculosis unit and 147 for a mental disease unit, according to statement made by the area medical officer for the Veterans Administration.

Dr. James S. McLester, Birmingham, is the second physician to be elected to honorary membership by the Alabama Academy of General Practice, Dr. James R. Garber, Birmingham, being the first. The certificates awarded state the "Alabama Academy of General Practice hereby elects ——— as an Honorary Member in recognition of his outstanding achievements and contributions to the general practice of medicine."

ARKANSAS

Dr. Katherine Dodd, formerly associate professor of pediatrics, University of Cincinnati College of Medicine, Cincinnati, Ohio, and a member of the staff of the Children's Hospital Research Foundation, has been appointed professor of pediatrics and head of the Department of Pediatrics, University of Arkansas School of Medicine, Little Rock.

Dr. William A. Reilly, formerly Professor of Medicine, University of Arkansas School of Medicine, Little Rock, has accepted a position as Chief of the Radioisotope Laboratory of the Veterans Administration Hospital, San Francisco, California.

Dr. C. H. Frank, Texarkana, was recently elected president of the Association of Tumor Clinic Staffs in Arkansas.

Dr. E. D. McKnight, Brinkley, has been reappointed to the Arkansas State Board of Health.

Dr. S. B. Moss, McGehee, has been elected a director of the local Chamber of Commerce.

Dr. Frank Kumpuris, Little Rock, has been taking special work in cardiovascular surgery in New York.

Dr. H. T. Smith, McGehee, was installed president of the Mid-South Postgraduate Medical Assembly at its meeting held in Memphis.

DISTRICT OF COLUMBIA

Washington Psychiatric Society has installed Dr. Zigmond M. Lebensohn president; and elected Dr. Henry P. Laughlin, president-elect; Dr. Seymour J. Rosenberg, secretary; and Dr. Marshall deG. Ruffin, treasurer.

Dr. Edward H. Cushing, Washington, recently resigned his position as Assistant Chief Medical Director for Research and Education of the Veterans Administration and is succeeded by Dr. George Marshall Lyon, founder and director of the extensive radioisotope program in VA hospitals.

Dr. Robert G. McCorkle, Jr., Washington, has been named the year's outstanding surgical house physician at George Washington University Hospital.

Dr. Charlotte Donlan recently assumed her new duties as Director of the Cancer Detection Clinic of George Washington University School of Medicine.

Dr. John P. McGovern, assistant professor of pediatrics, George Washington University, Washington, has received $8,000 in grants for research in the use of new drugs in the treatment of infants and children; $3,500 from Charles Pfizer & Company, Inc., for studies with antibiotics as regards their growth promoting factors in premature infants, uses in cases of whooping cough, and studies of the effectiveness of new routes of administration; and $4,500 from White Laboratories for an evaluation of the drug, molybdenum, in compounds containing iron to determine its effectiveness in the treatment of iron deficiency anemias in infants and children.

Dr. M. G. Candau, who resigned last December as Assistant Director General of World Health Organization, in charge of the Department of Advisory Services, at headquarters in Geneva, Switzerland, arrived in Washington recently to take up his new duties as Assistant Director of the Pan American Sanitary Bureau, Regional Office of the World Health Organization. Dr. Candau

replaces Dr. Paulo C. A. Antunes, who left the Bureau in December to become Dean of the School of Hygiene and Public Health of the University of Sao Paulo, Brazil.

Georgetown University School of Medicine, Washington, has affiliated with it the St. Mary's Hospital of Rochester, Minnesota, to augment its teaching facilities, Dr. Harold J. Jeghers, professor of medicine at Georgetown University, directing this new venture in the field of postgraduate education. Full-time staff members from Georgetown will visit St. Mary's monthly for periods of four or five days, and interns and residents will be rotated for brief periods through the Georgetown center; and St. Mary's attending staff members will visit Georgetown center for special instruction and observation.

Dr. John C. Nunemaker, Chief of Medical Service, Veterans Administration Hospital, Salt Lake City, and Assistant Professor of Medicine, University of Utah College of Medicine, has been appointed Chief of the Research Division, Research and Education Service, Department of Medicine and Surgery, Washington, as announced by the Chief Medical Director of Veterans Administration.

George Washington University, Washington, has received two grants for care and clinical research in cancer from the Alexander and Margaret Stewart Fund, the grants being designed to help incurable persons: $25,000 for home care of patients too ill to come to clinic but not ill enough to require hospital care; and $20,184 for research to evaluate methods of treating cancer patients who are beyond help by routine surgical or x-ray therapy. Both grants will continue projects in progress previously supported by the Stewart Fund at the George Washington University Cancer Clinic under the direction of Dr. Calvin T. Klopp.

FLORIDA

Dr. John S. McEwan, Orlando, has been named president of the Orlando Utilities Commission, after serving a four-year term as vice-president.

Dr. Lawrence E. Geeslin, Jacksonville, recently attended a graduate course in Philadelphia held under the auspices of the American College of Physicians.

Florida Tuberculosis and Health Association will hold its annual meeting May 15-17 in Daytona Beach. The Florida Trudeau Society is meeting in conjunction with the Association.

Dr. Robert C. Welsh, Miami, and Miss Cynthia Everett, Indianapolis, Indiana, were married recently.

Dr. Earle Templeton and Dr. DeWitt C. Daughtry, both of Miami, were members of a group of leading medical specialists from New York who made a tour recently under the sponsorship of the World Medical Association to bring latest medical technics and developments to physicians in Cuba, the Dominican Republic, Venezuela and Panama.

A Seminar on Diagnosis, designed primarily for diagnosticians, internists and physicians desiring to improve their diagnostic acumen, will be held in Jacksonville, George Washington Hotel, June 19-21, as announced by the Department of Medicine of the Graduate School of the University of Florida through the Committee on Medical Postgraduate Course of the Florida Medical Association.

Dr. M. Eugene Flipse has been taking postgraduate work in internal medicine and the subspecialty of pulmonary diseases at the Mayo Foundation, Rochester, Minnesota, and will continue there another year studying cardiovascular diseases, after which he plans to reestablish his practice in Miami.

GEORGIA

The authorization of a new radioisotope unit in the Veterans Administration Hospital, Atlanta, has been announced, the activity of which will be conducted in close cooperation with and under the advisory guidance of a committee from the staff of the local medical school. Facilities will be provided for qualified personnel to utilize radioisotopes in biological and medical research, in clinical diagnostic studies, and in clinical therapy when appropriate. Other new units located in the South are at New Orleans, Louisiana and Durham, North Carolina.

Medical College of Georgia, Augusta, has been awarded a grant of $17,280 by the Life Insurance Medical Research Fund for research by Dr. W. F. Hamilton on blood pressure and blood flow under normal, pathological, and experimental conditions.

Dr. A. Calhoun Witham has joined the staff of the Medical College of Georgia, Augusta, as assistant professor of physiology. Dr. Witham, formerly of Chamblee, recently returned from studies at the University of London.

Dr. Van B. Bennett and his wife, Dr. Sybil Corbett, have opened offices in Valdosta, Little-Green Hospital. He will practice internal medicine and cardiology, and she allergy and dermatology. They formerly practiced for several years in Jasper, Florida.

Dr. W. A. Matthews has returned to his practice in Atlanta after doing graduate work at Emory University for six months.

Dr. Robert C. Behrens, formerly of Atlanta, has opened an office in the Oakdale community where he will serve the Fitzhugh Lee section of south Cobb County.

Dr. A. W. Davis, Warrenton, has been chosen Warren County's Man of the Year for 1951.

Dr. M. Fernan-Nunez, a native of Emanuel County, has been advanced from chief pathologist and director of laboratories at the Dublin Veterans Administration Hospital to the grade of chief, the highest rating in the VA department of medicine and surgery.

Dr. Joseph D. McElroy, has resumed practice in Atlanta, after six months of special work in psychiatry and neurology at St. Elizabeth's Hospital in Washington, D. C.

Dr. A. V. Gafford recently became associated with the Harbin Clinic, Rome, practice limited to ophthalmology and otolaryngology. He will be associated in practice with Dr. George B. Smith and Dr. Tom Harbin.

Dr. William H. Holden, who has practiced in New York City for twenty-five years and been connected with the Harvard Medical School for ten years, has located in Macon for the practice of eye, ear, nose and throat and plastic surgery.

Dr. J. Righton Robertson, Augusta, succeeds Dr. J. Victor Roule as head of the Richmond County Board of Health. Dr. Roule held the office for twelve years.

Georgia Warm Springs Foundation, Warm Springs, was awarded $14,490 in the March of Dimes fund for the purpose of increasing the number of skilled persons required in carrying on research and in providing adequate care for patients. Dr. Robert L. Bennett is director of physical medicine at the Foundation.

Dr. Vernon B. Link has been transferred to Atlanta, headquarters of the Communicable Disease Center, from San Francisco, and designated Deputy Officer in Charge of the Center, succeeding Dr. Justin M. Andrews.

KENTUCKY

The First Statewide Conference on Rural Health will be held in Louisville, Brown Hotel, May 7 and 8, being sponsored by the Kentucky State Medical Association and co-sponsored by other member organizations of the Council.

Dr. Gradie R. Rowntree, Louisville, Professor of Community Health of the University of Louisville School of Medicine, and Chairman of the Kentucky State Medical Association Committee on Industrial Health, was recently elected Chairman of a new American Medical Association committee activated at the Twelfth Annual Congress on Industrial Health, sponsored by the A.M.A. in Pittsburgh early in the year.

Hill-Burton Hospital Construction Program as of January 1, 1952, consists of 23 projects under construction in Kentucky at a total cost of $12,226,811, including federal contribution of $7,535,287 and designed to supply 1,228 additional beds; 8 projects approved, but not yet under construction, at a total cost of $4,503,284, including $2,988,857 federal contribution and designed to supply 462 additional beds; 23 projects completed and in operation, at a total cost of $12,689,893, including federal contribution of $4,852,625 and supplying 905 additional beds.

Dr. Lawrence M. Quill, Newport, has been elected to the Southern Surgical Association.

Dr. Maurice Kaufman, Lexington, announces the association of Dr. Lloyd Dewald Mayer in the practice of allergy.

Dr. Bert E. Moore, formerly connected with the Tuberculosis Hospital at Madisonville, is located in Mauston, Wisconsin.

Dr. Keith Crume, Bardstown, has formed a partnership with Dr. H. M. Millen, who has recently returned to Bardstown from Lawrenceburg, Tennessee.

Dr. Harry Starr, formerly of Philadelphia, Pennsylvania, is associated with Dr. H. Lester Reed, Louisville, practice limited to neurosurgery.

A $100,000 trust fund given by Mrs. Mary A. Pirtle, Cleveland, in memory of her husband, an engineer and native of Glenview, has been set up at the Children's Hospital in Louisville for medical rehabilitation of the crippled children.

Dr. Kenneth Chapman, former assistant chief of the division of hospitals of the United States Public Health Service in Washington, D. C., succeeds Dr. Victor Vogel as medical officer in charge of the U. S. Public Health Service Hospital, Lexington. Dr. Vogel now of Paris, France, is medical director of the U. S. Public Health Service in Europe and the British Isles.

Dr. Peter J. Trinca, who formerly operated the Haws Memorial Hospital, Fulton, has moved to Iona, Michigan.

Dr. Charles E. Hall is located with the Harlan Hospital, Harlan.

Dr. Irvin S. Miller, recently of Clintwood, California, has an office with Dr. Dana Snyder, Hazard.

Continued on page 38

as an antihistaminic agent

Pyribenzamine® is unsurpassed

in hay fever . . .

in allergic rhinitis

in urticaria

in serum sickness

in angioneurotic edema

in drug reaction

***for* maximum relief**

***with* minimal side effects**

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Continued from page 476

Dr. John B. McHugh, formerly chief of professional services at the Veterans Administration Hospital at Outwood and recently manager of the Veterans Administration Hospital at Minot, North Dakota, will be manager of the 498-bed VA hospital under construction at Kansas City, Missouri.

Dr. U. Pentti Kokko has been appointed associate professor in child health research at the University of Louisville School of Medicine, Louisville. He will continue studies in poliomyelitis in the school's Kentucky Child Health Foundation Laboratory, which is under the direction of Dr. Alex J. Steigman, professor of child health.

Dr. Bruce Underwood, Louisville, a state delegate to the meeting of the American Medical Association in December, 1951, was appointed to the Reference Committee on Medical Education and Hospitals.

LOUISIANA

Dr. Rudolph Matas, emeritus professor of surgery, Tulane University of Louisiana School of Medicine, New Orleans, was recently honored when the Young Men's Business Club of New Orleans dedicated a monument at Charity Hospital, the ceremony in commemoration of the victory of medical science over yellow fever and in honor of Dr. Matas.

Tulane University School of Medicine, New Orleans, has been awarded a grant of $17,280 by the Life Insurance Medical Research Fund for research by Dr. N. B. Kurnick on the relation of certain enzyme systems to susceptibility of the blood vessels to disease; and $19,440 for research by Dr. Walter S. Wilde on the sequence of chemical and physical events in heart muscle.

Dr. Alton Ochsner, professor and chairman of the department of surgery, Tulane University School of Medicine, New Orleans, has received honorary appointment as professor in the School of Medicine, Surgery and Obstetrics of the Universidad Nacional de Nicaragua.

Dr. Albert Miller, associate professor of parasitology, Department of Tropical Medicine, Tulane University School of Medicine, New Orleans, has received an appointment to the editorial board of *Annals* of the Entomological Society of America for a two-year term.

Touro Infirmary Staff, New Orleans, has re-elected to its medical executive committee Dr. Arthur Caire, Jr., Chairman; and elected as other officers Dr. H. L. Kearney, vice-president; and Dr. J. D. Russ, secretary.

Dr. George W. Cooper has been awarded the 1951 loving cup of the New Orleans branch of the National Writers Club of Denver, this cup being awarded to the writer who won the greatest number of first prizes in the monthly poetry contests sponsored by the club's poetry section.

Dr. Waldemar R. Metz has received a citation from the United States Public Health Service for thirty years of continuous and uninterrupted service as attending specialist at the United States Marine Hospital, New Orleans.

Dr. Robert P. Ball, Baton Rouge, was elected vice-president of the American College of Radiology at its annual meeting held in Chicago in February.

Dr. Edmund Connely and Dr. Charles S. Holbrook, two outstanding psychiatrists of New Orleans, were signally honored at the annual staff banquet of the DePaul Sanitarium in January, being presented a plaque for distinguished and meritorious services to the institution throughout the many years as members of the staff.

Dr. Myron E. Wegman, head of the Department of Pediatrics, Louisiana State University School of Medicine, New Orleans, has been appointed to the staff of the Pan American Sanitary Bureau, Regional Office of the World Health Organization. He will take charge of the bureau's newly-created Division of Education, Training and Technical Services on June 1.

Tulane University School of Medicine, New Orleans, has received $16,845 in March of Dimes funds for important studies in poliomyelitis, $10,045 to seek new knowledge of the disease process and $6,800 will finance a study to determine how such non-paralytic polio is caused by the Coxsackie virus.

MARYLAND

A bronze bust of Dr. William Stewart Halsted was presented to the Department of Surgery, Johns Hopkins Hospital, at the Halsted Centennial meeting held in Baltimore on February 17, the presentation being made by Dr. William F. Reinhoff, Jr., associate professor of surgery, Johns Hopkins University. Dr. Halsted was the first head of the Department of Surgery established in 1889 at the Johns Hopkins Hospital.

Dr. Bertram Groesbeck, Jr., Rear Admiral, assistant chief of the Navy's Bureau of Medicine and Surgery, was honored recently

Continued on page 46

THE NEW YORK POLYCLINIC

MEDICAL SCHOOL AND HOSPITAL

(ORGANIZED 1881)

(The Pioneer Post-Graduate Medical Institution in America)

EYE, EAR, NOSE and THROAT

A combined full-time course covering an academic year (9 months). It consists of attendance at clinics, witnessing operations, lectures, demonstration of cases and cadaver demonstrations; operative eye, ear, nose and throat on the cadaver; head and neck dissection (cadaver); clinical and cadaver demonstrations in bronchoscopy, laryngeal surgery and surgery for facial palsy; refraction; radiology; pathology; bacteriology; embryology; physiology, neuroanatomy; anesthesia; physical medicine; allergy; examination of patients preoperatively and follow-up postoperatively in the wards and clinics. Also refresher courses (3 months).

PROCTOLOGY and GASTROENTEROLOGY

A combined course comprising attendance at clinics and lectures; instruction in examination, diagnosis and treatment; witnessing operations; ward rounds; demonstration of cases; pathology; radiology; anatomy; operative proctology on the cadaver; attendance at departmental and general conferences.

DERMATOLOGY and SYPHILOLOGY

A three year course fulfilling all the requirements of the American Board of Dermatology and Syphilology. Also five-day seminars for specialists, for general practitioners, and in dermatopathology.

RADIOLOGY

A comprehensive review of the physics and higher mathematics involved, film interpretation, all standard general roentgen diagnostic procedures, methods of application and doses of radiation therapy, both x-ray and radium, standard and special fluoroscopic procedures. A review of dermatological lesions and tumors susceptible to roentgen therapy is given, together with methods and dosage calculation of treatments. Special attention is given to the newer diagnostic methods associated with the employment of contrast media such as bronchography with Lipiodol, uterosalpingography, visualization of cardiac chambers, perirenal insufflation and myelography. Discussions covering roentgen departmental management are also included; attendance at departmental and general conferences.

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Furacin Vaginal Suppositories are being used preoperatively to eradicate accessible bacterial infections of both the cervix and vagina.

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Furacin® is stable at body temperature —remains effective in the presence of exudates—is bactericidal to many gram-negative and gram-positive pathogens.

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TO MINIMIZE MALODOR

TO FACILITATE HEALING

Furacin Vaginal Suppositories

Furacin Vaginal Suppositories contain Furacin 0.2%, brand of nitrofurazone N.N.R. in a water-dispersible base which is self-emulsifying in vaginal fluids and which clings tenaciously to the mucosa. Each suppository is hermetically sealed in foil which is leak-proof even in hot weather. They are stable and simple to use.

These suppositories are indicated for bacterial cervicitis and vaginitis, pre- and postoperatively in cervical and vaginal surgery.

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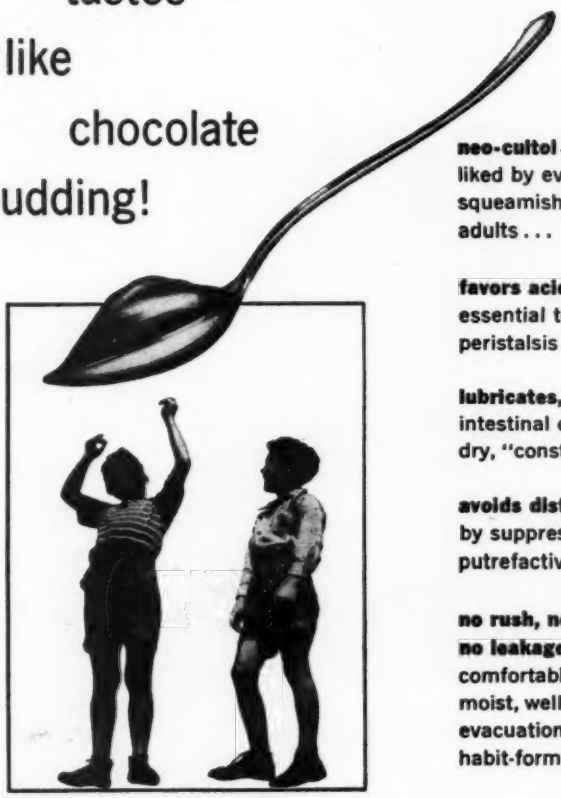
provides viable L. acidophilus which multiply rapidly in the colon, in a chocolate-palatable mineral oil jelly.

tastes like chocolate pudding!



neo-cultol— liked by even squeamish children and adults...

favors aciduric flora essential to normal peristalsis and daily regularity.

lubricates, softens intestinal contents to prevent dry, "constipated" feces.

avoids distressing flatulence by suppressing putrefactive bacteria.

no rush, no griping, no strain—no leakage comfortably passed, moist, well formed evacuations—without harsh, habit-forming cathartics.

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L. Acidophilus in chocolate-flavored mineral oil jelly

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Wide-mouth jars of 6 oz.

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ALTEPOSE® Tablets decrease appetite, increase metabolic processes and reduce nervous tension and irritability, to make it easier for your obese patients to adhere to a reducing diet regimen. Each ALTEPOSE Tablet contains the sympathomimetic, PROPADRINE®, 50 mg., Thyroid, 40 mg., and DELVINAL®, 25 mg. Supplied in bottles of 100 and 1,000. Sharp & Dohme, Philadelphia 1, Pa.

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When taken about half an hour before meals, orange or grapefruit juice is highly effective in helping overweight patients to adhere to their reducing regimens. Citrus has "very definite advantages"* as an appetite appeaser. It helps to reduce the demand for high caloric foods, and supplies readily utilizable carbohydrates to combat hypoglycemia. It is economically available in homes or restaurants. And, of no small consideration, most everyone likes orange or grapefruit juice.

* *Postgrad. Med. 9:106, 1951.*

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ORANGES • GRAPEFRUIT • TANGERINES

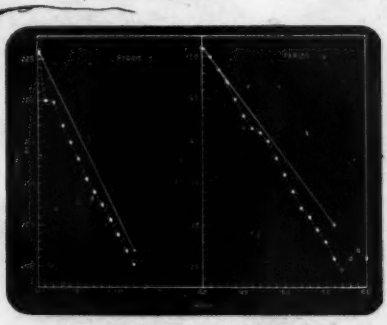

CHART OF WEIGHT LOSS
BROKEN LINE—OBSERVED LOSS • SOLID LINE—PREDICTED LOSS

1. IMMEDIATE
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reduction in blood pressure

Capsules *Ray-Trote* combine three supplementing therapeutic agents which serve to control high blood pressure with maximum efficiency. Capsules *Ray-Trote* introduce a timing element essential for the safest and most satisfactory control of hypertension.

Nitroglycerin: Because of its rapid vasodilating action, nitroglycerin reduces blood pressure almost instantaneously. To give the patient immediate relief, it still remains the drug of choice.

Sodium nitrite: Sodium nitrite is a somewhat slower acting vasodilator, and begins to take full effect as the action of nitroglycerin subsides.

Veratrum viride: Chemically standardized veratrum viride is probably the most active and reliable cardiac depressant.[1] Although slow to act, its depressant effect on blood pressure is prolonged, exceeding that of sodium nitrite by several hours.

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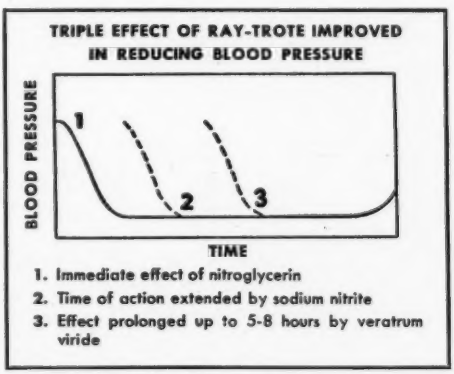
Phenobarbital: Capsules *Ray-Trote* also contain phenobarbital, to maintain a calmer, more restful hypertensive patient.

Dosage: One capsule every three or four hours. Discontinue use if pulse becomes abnormally slow, or patient complains of nausea.

1. Sollman, T.: A Manual of Pharmacology, W. B. Saunders Co., 1942.

3-stage action
to control hypertension

Capsules
RAY-TROTE
Improved


TRIPLE EFFECT OF RAY-TROTE IMPROVED IN REDUCING BLOOD PRESSURE
BLOOD PRESSURE
1
2
3
TIME
1. Immediate effect of nitroglycerin
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Formula: Each capsule contains:

Nitroglycerin	0.25 mg.
Sodium Nitrite	30 mg.
Veratrum Viride (standardized to 1.0% alkaloid content)	65 mg.
Phenobarbital	15 mg.

Supplied in bottles of 100, 500 and 1,000 capsules. Also available, Capsules Ray-Trote with Rutin. *In addition to the* Ray-Trote *formula, each capsule contains Rutin, 20 mg.*

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"Maybe if America had been strong enough to discourage aggression two years ago, my friend, Jesse Brown, might be alive right now. So might thousands more of our Korea dead.

"For it's only too sadly true—today, in our world, weakness invites attack. And *peace is only for the strong.*

"Our present armed forces *are* strong—and growing stronger. But don't turn back the clock! Do your part toward *keeping* America's guard up by buying more . . . and more . . . and more United States Defense Bonds *now!* Back us up. And *together* we'll build the strong peace that all Americans desire!" *Peace is for the strong! Buy U. S. Defense Bonds now!*

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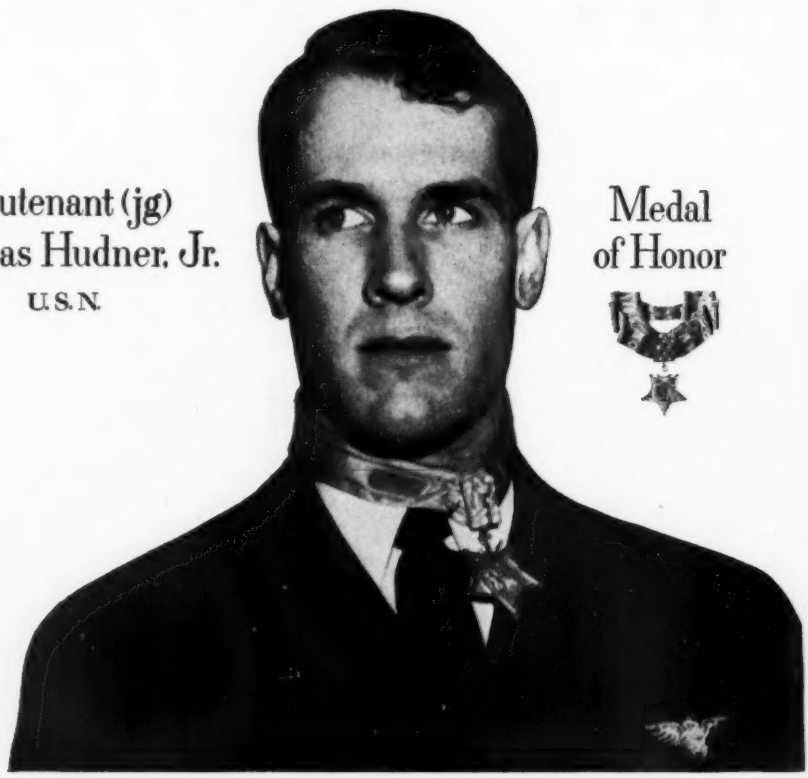
Remember that when you're buying bonds for defense, you're also building a reserve of savings. Remember, too, that if you don't save *regularly*, you generally don't save at all. So sign up today in the Payroll Savings Plan where you work, or the Bond-A-Month Plan where you bank. For your country's security, and your own, buy U. S. Defense Bonds now!

Lieutenant (jg)
Thomas Hudner, Jr.
U.S.N.



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to allay anxiety . . .

to help combat depression . . .

to promote restful sleep

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TRADEMARK

- Provides the recognized sedative action of ***phenobarbital***

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- the antispasmodic effect of ***belladonna alkaloids***

Four dosage forms . . . for individualized therapy

	Phenobarbital	Belladonna Alkaloids	Supplied
BELBARB* Tablet #1 per tablet	⅛ gr.	hyoscyamine, atropine, and scopolamine in fixed proportion, approximately equivalent to Tr. Belladonna, 8 min.	Bottles of 100, 500, and 1,000 tablets
BELBARB Tablet #2 per tablet	¼ gr.		Bottles of 100, 500, and 1,000 tablets
BELBARB Capsules per capsule	¼ gr.		Bottles of 100, 500, and 1,000 capsules
BELBARB Elixir per fluidrachm (4 cc.)	⅛ gr.		Bottles containing 6 fl. oz., 1 pt., and 1 gal.

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NARKOGEN (Tilden) contains CHLORAL HYDRATE, "still the standard hypnotic of its class," and "one of the most reliable of sedative agents."* Ordinary doses act promptly to produce a natural, physiological sleep which "lasts at least several hours" and the patient "awakens refreshed."* A recent J.A.M.A. article notes that chloral hydrate and the bromides "are probably the most useful means of promoting daytime relaxation without too much sleepiness." (147:1311, 1951.)

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	per fluid ounce	per 100 cc.
Chloral Hydrate	..80 gr.	17.5 Gm.
Potassium Bromide	..80 gr.	17.5 Gm.
Hyoscine Hydrobromide	..1/25 gr.	9 mg.

Horsenettle, Wild Lettuce and Celery Seed.
Alcohol 10%.

USE NARKOGEN for restful sleep in insomnia, for sedation and control of spasms in highly nervous and excitable patients. Supplied in pint and gallon bottles.

Samples and *new literature on request.

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Continued from page 38

when the Aero Medical Association presented to him the Theodore C. Lyster Award for 1951 at the Naval Medical Center, Bethesda. The award is presented each year to the one who contributes most to the advancement in the field of aviation medicine.

Dr. Paul W. Clough, Baltimore, has retired as editor-in-chief of the *Quarterly Review of Internal Medicine and Dermatology*.

Dr. Robert P. Williams, Brig. Gen., who retired from the United States Army last year after thirty-six years of service, has been appointed state deputy director of Health Services for Civil Defense to serve with Dr. Robert H. Riley, Baltimore director, State Department of Health, and director of Health Services for Civil Defense.

Johns Hopkins University School of Medicine, Baltimore, has been awarded a grant of $16,200 by the Life Insurance Medical Research Fund for research by Dr. Francis P. Chinard on the passage of substances across the membranes of capillary blood vessels and transport mechanisms in the kidneys; $8,100 for research by Dr. Elliot V. Newman on the theory, technic, and application of the dye dilution principle for describing circulatory systems; $5,940 for research by Dr. E. K. Marshall, Jr., on the pharmacology of cinchoninic acid derivatives; and $17,280 for research by Dr. Samuel A. Talbot on the dynamical basis of the spatial ballistocardiogram.

The *Maryland State Medical Journal*, the official publication of the Medical and Chirurgical Faculty of the State of Maryland, incorporates the former *Bulletin* and *Newsletter*. Dr. George H. Yeager, Baltimore, is editor.

MISSISSIPPI

Dr. W. H. Anderson, Booneville, is a member of the Mead Johnson General Practice Scholarship Committee, composed of family physicians (six) from all parts of the country. The committee was created by the American Academy of General Practice to act as trustees of a recently announced annual scholarship award for outstanding students. This is a $1,000 cash award given each year to five selected medical graduates who wish to pursue a year of residency training, following internship, in general practice.

Students interested in State medical education scholarship loans to become effective during the summer months are urged to contact the State Medical Education Board, 1205 Woolfolk State Office Building, Jackson, at once for information and application forms. Over sixty young physicians who have completed medical training with the aid of such loans are now practicing in Mississippi, and another group of approximately sixty are in internship and will be ready to enter practice in the summer and fall. The purpose of such loans is to obtain more family doctors for the rural areas of Mississippi; the recipients of the loans agree to enter practice in rural areas of the State of Mississippi.

MISSOURI

Missouri Academy of General Practice will hold its fourth annual assembly at Jefferson City, Governor Hotel, May 7-8.

St. Louis Society of Radiologists has elected Dr. Hugh M. Wilson, president; Dr. Hyman R. Senturia, vice-president; and Dr. Donald S. Bottom, secretary-treasurer.

Washington University School of Medicine, St. Louis, has been awarded a grant of $30,240 by the Life Insurance Medical Research Fund for research by Dr. W. Barry Wood, Jr., on the cellular physiology of acute inflammation; $16,200 for research by Dr. Robert J. Glaser on streptococcal infections and their relation to rheumatic fever; $12,530 for research by Dr. Henry A. Schroeder on the influence of the normal and ischemic kidney on the metabolism of amino acids; $10,585 for research by Dr. Robert F. Furchgott on the relationship between contractility and metabolism of smooth muscle; and Dr. Horace Mitchell Perry, Jr., St. Louis, a postdoctoral research fellowship carrying an award from $3,300 to $4,500 for research under the guidance of Dr. Henry A. Schroeder at the Medical School.

Dr. Robert A. Moore, dean, Washington University School of Medicine, St. Louis, went to Bangkok, Thailand in February, where, as director of the Washington University-Thailand medical schools teaching assistance program, he lectured on pathology and observed results of the exchange program. Washington University School of Medicine was the first school in the nation to establish a cooperative teaching program under the Marshall Plan, plans for the project being completed a year ago.

NORTH CAROLINA

Duke University School of Medicine, Durham, will hold a Postgraduate Course at the Duke Hospital Amphitheatre on June 16-19 as announced by Dr. William M. Nicholson, Director of Postgraduate Education. Registration fee, $25.00.

Continued on page 50

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Available as Vifort soft-gelatin capsules, in bottles of 30, 100 and 250; also Vifort Drops, ideal for infants and children, in 15 and 30 cc. dropper bottles.

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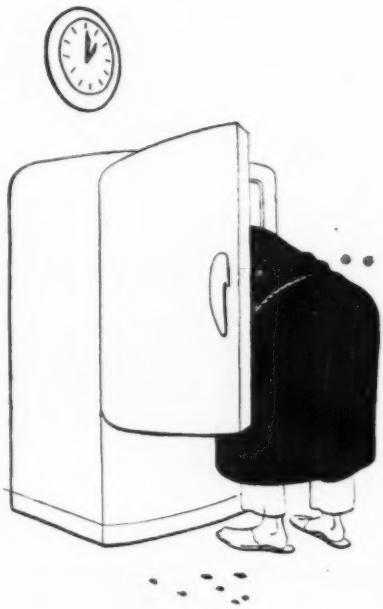

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"Patients who have been gaining excessively but are on reduced caloric intakes, will tell you that they are not eating excessively; that there is something wrong with them because they gain weight. Obviously they are cheating, consciously or unconsciously. One cannot gain weight on air and water."[1]

AMPLUS helps control the obese patient's urge to cheat. The appetite-curbing effect of dextro-Amphetamine Sulfate, plus the nutritional supplementation of 8 Vitamins, 11 Minerals, and Trace Elements increases patient co-operation, and guards against nutritional deficiencies frequently encountered in obese patients.

1. Dieckmann, W. J.; Turner, D. F.; Meiller, E. J.; Straube, M. T.; Grossnickle, K. B.; Pottinger, R. E.; Hill, A. J.; Savage, L. J.; Forman, J. B.; Priddle, H. D.; Beckette, E. S.; Schumacher, E. M.: Diet Studies in Pregnant Patients. Obst. & Gynec. Surv. 3:731 (Oct.) 1948, p. 742.

To help cheaters to self-control, prescribe . . .

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Each capsule contains:

DEXTRO-AMPHETAMINE SULFATE...	5 mg.
Calcium.....	242 mg.
Cobalt.....	0.1 mg.
Copper.....	1 mg.
Iodine.....	0.15 mg.
Iron.....	3.33 mg.
Manganese.....	0.33 mg.
Molybdenum.....	0.2 mg.
Magnesium.....	2 mg.
Phosphorus.....	187 mg.
Potassium.....	1.7 mg.
Zinc.....	0.4 mg.
Vitamin A.....	5,000 U.S.P. Units
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Thiamine Hydrochloride.....	2 mg.
Riboflavin.....	2 mg.
Pyridoxine Hydrochloride.....	0.5 mg.
Niacinamide.....	20 mg.
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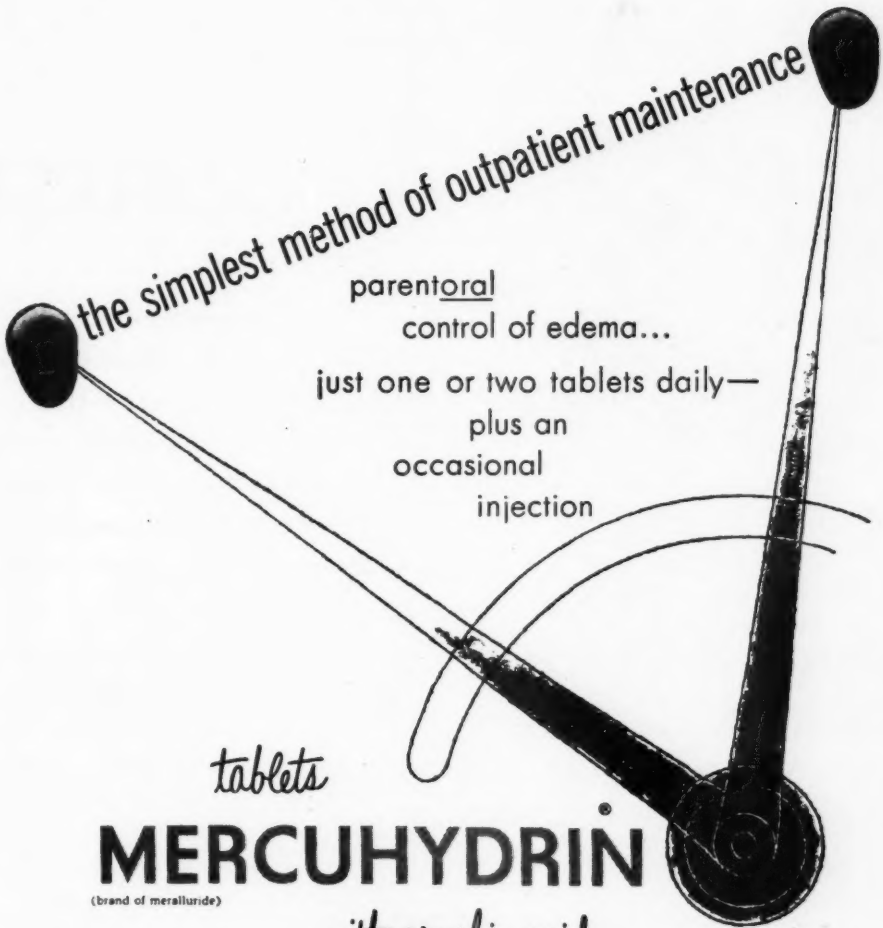

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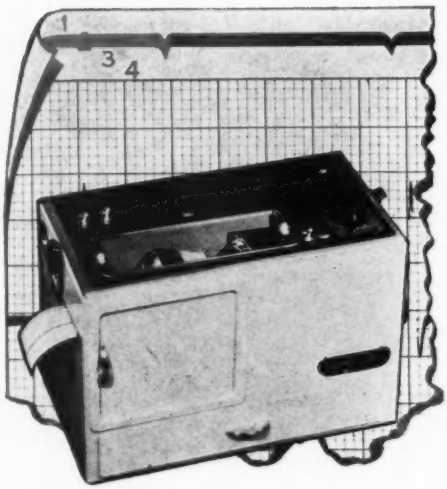

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Continued from page 46

University of North Carolina School of Medicine, Chapel Hill, announced the new appointments to the staff: Dr. W. P. Richardson as professor of preventive medicine and assistant dean in charge of continuation education; Dr. David A. Young as clinical professor of psychiatry; Dr. Ernest Craige, Dr. Isaac M. Taylor, and Dr. Jeffress G. Palmer as assistant professors of medicine; Dr. Thomas B. Barnett as instructor in medicine; Dr. Richard M. Peters as assistant professor of surgery in thoracic surgery; Dr. Colin G. Thomas, Jr., as assistant professor of surgery in general surgery; and Dr. John B. Hill and Dr. Gabriel F. Tucker, Jr., as assistant professors of pharmacology.

Dr. Harold B. Spangler has opened an office in Rocky Mount, specialty limited to pediatrics.

Southern Neurosurgical Society, some 65 members or almost one-quarter of the world's brain surgeons, held their annual meeting at Duke University, Durham, in April.

Dr. William deMaria, instructor in pediatrics, Duke University School of Medicine, Durham, has received a $30,000 research grant from the John and Mary R. Markle Foundation of New York. Duke Medical School will administer and supplement the grant ($6,000 a year for five years). Dr. deMaria is working chiefly with heart and kidney diseases in children.

Dr. Wilburt C. Davison, dean, Duke University School of Medicine, Dr. Wingate M. Johnson, professor of clinical medicine, Bowman Gray School of Medicine, and Dr. Julian M. Ruffin, professor of medicine, Duke University School of Medicine, were among a group of the nation's outstanding medical figures who participated in all-day panel discussions of the President's Commission on the Health Needs of the Nation in Washington, D. C., April 8-10.

Duke University School of Medicine, Durham, has been awarded a grant of $22,140 by the Life Insurance Medical Research Fund for research by Dr. E. A. Sted, Jr., on cardiovascular and respiratory physiology, and organ metabolism; and $14,580 for research by Dr. Philip Handler on humoral relationships in hypertension.

SOUTH CAROLINA

Dr. John K. Webb, Greenville, was elected vice-president of the Tri-State Medical Association (Carolinas and Virginia) at its recent meeting held in Roanoke, Virginia.

Dr. Lawrence W. Stoneburner, of Ohio and Florida, is associated with Dr. Henry Ross, Greenville, in the practice of medicine.

Dr. Joseph W. McMeans, Florence, succeeded Dr. Ralph M. Weaver as pathologists at Anderson Memorial Hospital, Anderson.

TENNESSEE

Vanderbilt University School of Medicine, Nashville, has been awarded $7,020 by the Life Insurance Medical Research Fund for research by Dr. Margaret E. Greig on the relationship between permeability and enzyme activity of heart tissue; and Dr. Moris Lawrence Shore, Memphis, a predoctoral research fellowship by this Fund for research under the guidance of Dr. D. B. Silversmit at the University of Tennessee College of Medicine, Memphis.

Dr. Henry W. Scott, Jr., associate professor of surgery, Johns Hopkins Hospital, Baltimore, Maryland, has been appointed professor of surgery, Vanderbilt University School of Medicine, and surgeon-in-chief to the Vanderbilt University Hospital, Nashville, succeeding Dr. Barney Brooks, who will become professor emeritus.

Dr. Robert William Quinn, associate professor of preventive medicine, University of Wisconsin Medical School, Madison, has been appointed professor and head of the department of preventive medicine and public health at Vanderbilt University School of Medicine, Nashville. Dr. Alvin E. Keller, who has been acting head of the department, will continue as associate professor of preventive medicine and public health.

Methodist Hospital, Memphis, has elected to its staff Dr. Alfred D. Mason, president; Dr. Joseph H. Francis to serve his fourth term as chief of staff; and Dr. C. Ferrer Varner, secretary, reelected. New members of Executive Committee: Dr. James M. Bethea and Dr. Robin F. Mason.

Dr. Lloyd S. Nease, Newport, was elected president-elect of the Mid-South Postgraduate Medical Assembly at its meeting held in Memphis, and Dr. Dewey Peters, Knoxville, one of the regional vice-presidents.

Dr. George R. Livermore, Memphis, announces the association of Dr. Fontaine B. Moore, Jr., for the practice of urology and urological surgery.

Dr. J. E. Whiteleather, Memphis, announces the association of Dr. H. J. Thompson, Jr., in the practice of radiology.

Dr. John R. Sisk, formerly of Trenton, has opened an office in Harriman for the practice of medicine.

Continued on page 54

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1. *Dieckmann, W. J. and Priddle, H. D.: Am. J. Obstet. & Gynecol.* 57:*541 (March) 1949.*
2. *Chesley, R. F. and Annitto, J. E.: Bull. Margaret Hague Mat. Hosp.* 1:*68 (Sept.) 1948.*
3. *Healy, J. C.: J. Lancet* 66:*218 (July) 1946.*
4. *Neary, E. R.: Am. J. Med. Sc.* 212:*76 (July) 1946.*
5. *Talso, P. J.: J. Insurance M.* 4:*31 (Dec.-Jan.-Feb.) 1948-49.*
6. *Forman, J. B.: Conn. State M. J.* 14:*930 (Oct.) 1950.*
7. *Kelly, H. T.: Penn. M. J.* 51:*999 (June) 1948.*

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Continued from page 50

Dr. Rufus Morgan, a native of Chattanooga, has opened an office in the Bledsoe Memorial Hospital, Pikeville.

Dr. Earl R. Beets, a native of Clinton, has opened an office in Jefferson City for the practice of medicine.

Dr. W. N. Carpenter is associated with Drs. M. A. Blanton, Sr., M. A. Blanton, Jr., and Byron O. Gardner, Union City, in the practice of medicine and surgery.

Dr. Harold B. Boyd, Memphis, has been elected president-elect of the American Orthopaedic Surgeons.

Dr. Arliss H. Tuttle, research associate in pediatrics at the University of Tennessee College of Medicine, Memphis, is one of twenty-one medical scientists in North America, who received a $30,000 grant from the John and Mary R. Markle Foundation. Dr. Tuttle is doing research work in the Pediatrics Laboratory of the College of Medicine in John Gaston Hospital. He has been conducting studies on the treatment of hypertension in acute nephritis in children and anemia in premature infants.

Dr. Florence I. Mahoney, Chief of the Physical Medicine Rehabilitation Service, Kennedy Hospital, Memphis, represented the Woman's Medical College of Pennsylvania at the centennial celebration of the University of Tennessee.

Dr. Benjamin A. Cockrell succeeds Dr. Glen W. Doolen as manager of the 300-bed Veterans Administration tuberculosis hospital in Memphis. Dr. Cockrell was formerly chief medical officer of the Veterans Administration Regional Office at Chicago. Dr. Doolen is being transferred to the Central Office in Washington, D. C.

Dr. Jack N. Hunt, senior lecturer in physiology, Guy's Hospital Medical School, London, England, has been sent to the University of Tennessee College of Medicine, Memphis, by the Rockefeller Foundation to continue studies on the function of the digestive tract, working with the research group of Dr. Joseph P. Quigley, chief of the division of physiology.

TEXAS

Texas Academy of General Practitioners will hold its third annual scientific assembly at San Antonio, September 15 and 16.

Dr. James Walter Long, medical director, Gulf Oil Corporation at Port Arthur, is now medical director of entire Gulf Oil Corporation with headquarters at Pittsburgh.

University of Texas Medical Branch, Galveston, has been left a large sum from the estate of the late Andrew Cyrus McLaughlin, Los Angeles, California, for the study of infection and immunity. Mr. McLaughlin was the son of the late Dr. James Wharton McLaughlin, professor of medicine at the University from 1897 to 1905.

Baylor University College of Medicine, Houston, will receive a new income of approximately $200,000 a year under terms of a settlement of the contested will of the late Mrs. Helene Crosby Simmons. This bequest gives Baylor half interest in oil producing properties in Texas and Louisiana.

Texas Hospital Association will hold its annual meeting in Houston, The Shamrock Hotel, May 20-22.

Texas Society of Pathologists has installed Dr. Charles T Ashworth, president; and has elected Dr. A. O. Severance, San Antonio, president-elect; Dr. Raymond H. Rigdon, Galveston, vice-president; and Dr. Lloyd R. Hershberger, San Angelo, secretary-treasurer.

Dr. Herman W. Johnson, president of the Baylor Medical Foundation, has announced the establishment of the Walter H and Freda Moursund Endowment Fund at Baylor University School of Medicine, Houston. The endowment honors Dr. Moursund, dean since 1920.

Dr. Alando J. Ballantyne, following a three-year fellowship at Mayo Clinic, Rochester, Minnesota, has joined the staff of M. D. Anderson Hospital for Cancer Research as assistant surgeon.

Dr. Otto A. Bessey, formerly of the University of Illinois Medical Center, Chicago, is professor and chairman of the Department of Biochemistry and Nutrition, University of Texas Medical Branch, Galveston.

University of Texas Medical Branch, Galveston, has received a grant for research in biochemistry amounting to $3,700 made by the Williams-Waterman Fund. The research will be under the direction of John G. Bieri (Ph.D.), associate professor of biochemistry and nutrition.

University of Texas Medical Branch, Galveston, has been made a donation of $2,500 by the family of Mr. H. H. Weinert of Seguin, a former regent of the University, to support cardiovascular research under the direction of Dr. George Herrmann, professor of medicine.

Dr. William S. MacComb, who has been associated for several years with the Memorial Hospital Center for Cancer and Allied Diseases in New York as associate attending surgeon, has joined

Continued on page 58

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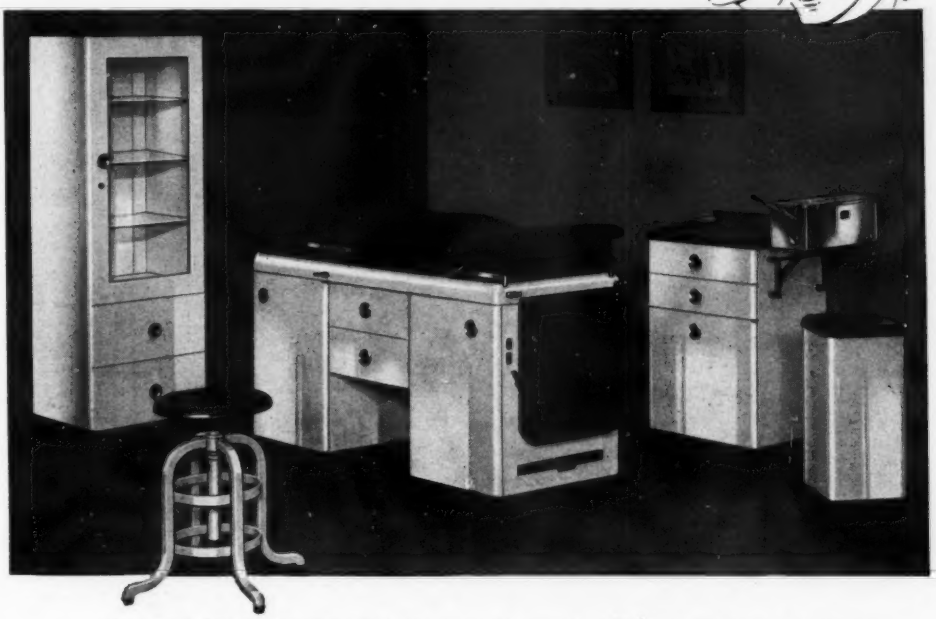

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CHLORINE	900 mg.	BIOTIN	0.03 mg.
COBALT	0.006 mg.	CHOLINE	200 mg.
*COPPER	0.7 mg.	FOLIC ACID	0.05 mg.
FLUORINE	3.0 mg.	*NIACIN	6.7 mg.
*IODINE	0.7 mg.	PANTOTHENIC ACID	3.0 mg.
*IRON	12 mg.	PYRIDOXINE	0.6 mg.
MAGNESIUM	120 mg.	*RIBOFLAVIN	2.0 mg.
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*PHOSPHORUS	940 mg.	*VITAMIN A	3200 I.U.
POTASSIUM	1300 mg.	VITAMIN B_{12}	0.005 mg.
SODIUM	560 mg.	*VITAMIN D	420 I.U.
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*PROTEIN (biologically complete)	32 Gm.
*CARBOHYDRATE	65 Gm.
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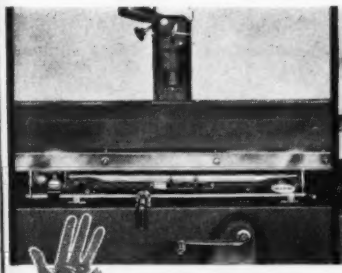

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Continued from page 54

the staff of the M. D. Anderson Hospital for Cancer Research, Houston, as associate surgeon in charge of the head and neck service.

Refresher Course for Medical Technologists is to be presented at Baylor University College of Medicine, Houston, by the Department of Biochemistry on August 18-23. Make application to Dr. J. H. Gast, Department of Biochemistry, Baylor University College of Medicine, Houston 25.

VIRGINIA

Virginia Academy of General Practice will hold its second annual scientific assembly at Roanoke, Hotel Roanoke, May 8-9.

Richmond Eye, Ear, Nose and Throat Society has elected Dr. Mason Smith, president; and Dr. C. N. Romaine, secretary-treasurer.

Dr. Fred C. Heath has resigned as health officer of Fairfax County and has been replaced by Dr. Harold Kennedy, who was transferred from the Henry-Martinsville Health District.

Medical Society of Virginia has moved its headquarters from the Richmond Academy of Medicine Building to the building at 1105 West Franklin Street, Richmond, purchased a year ago for $26,500. It is a thirteen-room house built forty years ago. The first floor accommodates the joint activities of the society and the *Virginia Medical Monthly*, and the Virginia Academy of General Practice has rented a part of the second floor.

Dr. James Asa Shield, Richmond, was elected president-elect of the Tri-State Medical Association (Carolinas and Virginia) at its meeting held in Roanoke recently; and Dr. J. F. Williams, Richmond, one of the vice-presidents.

Medical College of Virginia, Richmond, has received in gifts and grants since last July $530,000. Recent gifts are: $1,500 to the Medical College of Virginia Foundation by Dr. William R. Laird, Montgomery, West Virginia; $6,750 in the will of the late Dean Wortley F. Rudd of the school of pharmacy for student loans in that school; and $2,500 from an anonymous doner for the general student loan fund.

Dr. Edward V. Jones, former instructor in psychiatry, University of Michigan, Ann Arbor, has been appointed assistant professor of neurology and psychiatry, University of Virginia, Charlottesville. He will be responsible for the direction of the laboratories of encephalography.

WEST VIRGINIA

West Virginia Public Health Association will hold its 28th annual conference in Charleston, Boone Hotel, May 8-9.

West Virginia Diabetes Association will again sponsor a summer camp for diabetic children May 30-June 7, using the Carbide and Carbon Chemical Corporation's Camp Camelot which is forty-five miles from Charleston.

The Wilkinson Clinic, Huntington, announces the association of Dr. R. E. Crissey.

Dr. Bernard L. Allen, formerly manager of the Veterans Administration general medical and surgical hospital at Clarksburg, succeeds Dr. George O. Pratt as manager of the VA general medical and surgical hospital at Manchester. Dr. Pratt recently became manager of the new VA general medical and surgical hospital at Brooklyn, New York.

West Virginia Cancer Society, Inc., has elected Dr. Hu C. Myers, Philippi, president; Dr. Phillip Gibson, Huntington, vice-president; and reelected Dr. J. Ross Hunter, Charleston, and Dr. Homer Gebhart, Huntington, secretary and treasurer, respectively.

Dr. William A. Thornhill, Charleston, was elected second vice-president of the Southeastern Allergy Association at the seventh annual meeting held in Augusta recently.

Dr. John H. Burke has moved from Pageton to Princeton where he will continue in general practice.

Dr. Benjamin H. Reed, Jr., has moved from Jenkinjones to Pageton where he will continue in general practice.

Dr. Louis S. Smith, Charleston, has moved to Dallas, Texas, where he will continue the practice of his specialty of pathology.

Dr. Marion S. Brown will return to practice in Parkersburg after serving a residency in obstetrics at the City Hospital in Akron, Ohio.

Dr. James C. Quick has moved from Parkersburg to Clendenin where he will continue in general practice.

West Virginia University has retained architects and consultants for the initial buildings of the state health center to be erected on a 145-acre site less than a mile from the present campus at Morgantown. A medical school of the size contemplated calls for a teaching hospital of approximately 600 beds; it is planned to construct first a hospital wing of 200 beds and then the additional 400 beds as money becomes available. The basic science building, classrooms, laboratories for instruction in medicine, dentistry and nursing, is estimated to cost $4,000,000; and the heating plant and associated equipment approximately $1,000,000. The completed hospital, at present prices, may cost $12,000,000.

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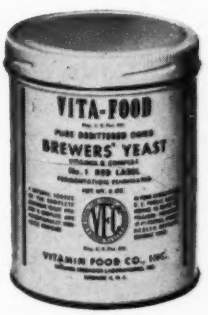

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Thiamine Hydrochloride	3.00 mg.
Riboflavin	2.00 mg.
Niacinamide	10.00 mg.
Ascorbic Acid	30.00 mg.
Ferrous Gluconate	45.00 mg.
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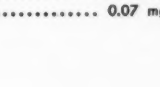
Walker



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(1) Hanson, I. R. and Hingson, R. A., *Current Researches in Anesthesia and Analgesia*, 29:136 (May-June) 1950

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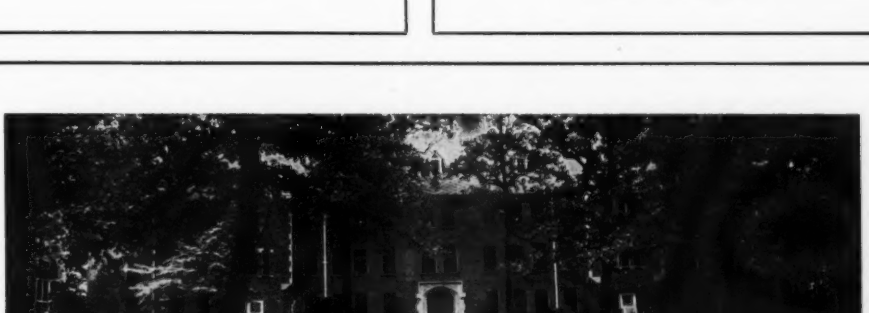

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Non-Dietary Factors in Feeding Problems

Emotional disturbances in infants and children may often be reflected in feeding problems with symptoms referable to the gastro-intestinal tract. Some of these difficulties are resolved by growth, others require therapy above and beyond dietary changes.

The literature stresses that certain G-I disorders in children can be produced by ***autonomic imbalance,*** and particularly excessive cholinergic (parasympathetic) impulses.

In these, the basic therapeutic need is for anti-cholinergic measures. The use of atropine (50-50 mixture of dextro- and levo-hyoscyamine) for this purpose is well-known. While the levo-form produces the necessary anti-cholinergic action, the dextro- component is the main source of atropine's central, toxic effects.

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a) Elixir: each 4 cc. (approx. one teaspoonful) contains:
0.0625 mg. (1/1000 gr.) Bellafoline
12.5 mg. (3/16 gr.) phenobarbital
(equivalent to ¼ Belladenal tablet)

b) Tablets: each containing: 0.25 mg. (1/260 gr.) Bellafoline
50 mg. (¾ gr.) phenobarbital

The table below is a guide to:

BEST DOSAGE IN CHILDREN*

AGE	ATROPINE DOSAGE SCHEDULE	DOSAGE OF BELLADENAL ELIXIR
1 to 12 months	1/1300 gr. to 1/650 gr.	½ teaspoonful
1 to 3 years	1/400 gr.	1 teaspoonful
3 to 6 years	1/150 gr.	2½ teaspoonsful
6 to 12 years	1/150 gr. to 1/75 gr.	1 tablespoonful

* This dosage schedule is based on findings of K. R. Unna et al: Pediatrics 6: 197, 1950.

For full dosage table and complete information and references on this subject, just request "Infant Feeding Problems" literature.

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1. Ann. Allergy 9:354

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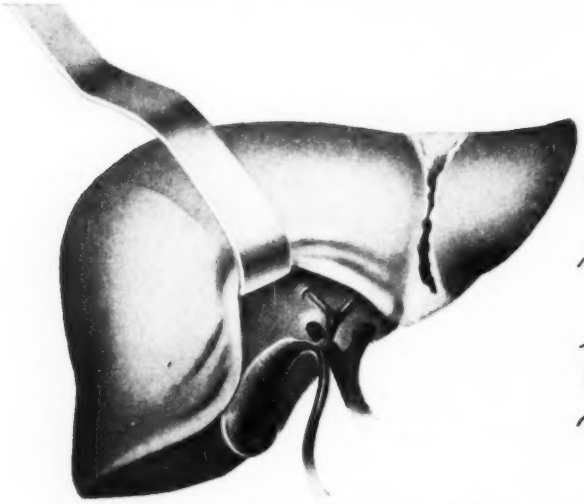

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